News of the Industry Begins Page 424

AUTOMOTIVE INDUSTRIES

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AUTOMOTIVE INDUSTRIES

VOLUME 54 *Philadelphia, Thursday, March 4, 1926* NUMBER 9

The Small Town—That's Where Biggest Automobile Market Lies

55 per cent of all motor vehicles in use in this country are in towns of less than 10,000 population. Seventy per cent of low-price car dealers located there.

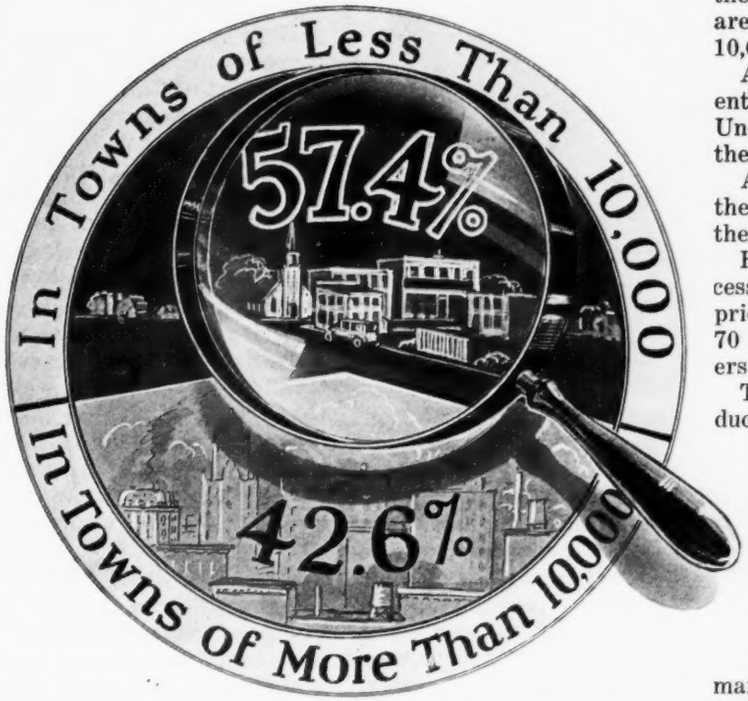
By Norman G. Shidle

THE small town—its people and its ways—have been much berated and much defended in fiction and speech during the last five years. From an automotive business standpoint only one view is possible or logical—the small town has been, is and will continue to be the backbone of automotive development.

Out in those areas referred to as "the sticks" by most of the sophisticated urbanites who make up the bulk of factory personnel; out there where the dealers are said to need education and where proper window displays and high-powered merchandising methods are usually conceived to be lacking; out there where we think of sales rooms being closed at dusk as the majority of the population turns off the radio and climbs into bed; out there where salesmen are still drummers in rural sections, the little villages and the towns of less than 10,000 population, the basis of American automotive growth is being made more solid every year.

Here are a few of the reasons why these towns of less than 10,000 population are of such vast importance to the manufacturers of motor vehicles in America today:

Total Automotive Sales, 1925



A special lens sometimes is necessary to visualize the importance of small things. The biggest automobile market is in the small towns

About 55 per cent of all the motor vehicles in use are in towns of less than 10,000 population.

About 58 per cent of the entire population of the United States is located in these small towns.

About 57 per cent of all the service stations are in these towns.

Every conspicuously successful manufacturer of low priced cars has more than 70 per cent of all his dealers in these areas.

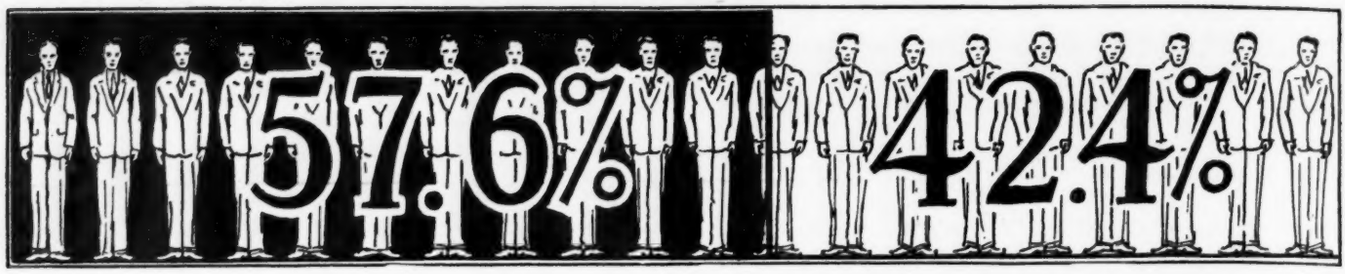
The four leading producers of high priced cars have a greater percentage of their retail outlets in towns of less than 10,000 population than have any of their less successful competitors.

One further fact of major significance remains to be added to the list: $3,980,000,000 worth of automotive products of all kinds were sold last year in towns of less than 10,000 population. This huge sum comprised 57.4 per cent of total retail automotive sales throughout the country.

Only 8.2 per cent of the total business was done in cities of over 500,000 population.

These figures, the result of a recent survey, clarify and reinforce the understanding of the importance of the small

Distribution of Population in United States



—In Towns of Less Than 10,000 —In Towns of More Than 10,000

Passenger Car Retail Outlets in Towns of Various Sizes

town market already current in the industry. Despite this understanding, however, it is only in exceptional cases that the smaller town merchants have received their proper proportionate share of factory attention and assistance.

How many car makers have concentrated nearly 60 per cent of their merchandising effort and thought on problems affecting dealers in towns of less than 10,000 population? How many factory representatives have clung to the comforts of the urban hotel rather than brave the hardships entailed in keeping in close touch with the problems of the men who last year sold more than half the output of their factories? How many factories have spent more than half their marketing thought in mapping out plans and ideas which were applicable chiefly in towns of more than 100,000 population where only 19.2 per cent of the automotive market lies and which were of relatively small value in towns of less than 10,000 population where 57.4 per cent of the market was in 1925?

Concrete consideration of factory merchandising effort in comparison with the figures given will in many cases indicate need for some readjustment of viewpoint as to the relative emphasis desirable on certain types of sales activity.

Those organizations which in the past have been most successful in outstripping competition have almost invariably been those which have paid the most attention to retail outlets in the smaller towns. The facts as regards the low priced car organizations are pretty generally known. It is to be expected that these companies, selling a low priced line with the necessity for quantity production and distribution, would have a very large proportion of their dealer outlets in the smaller towns and villages. This is the case. Chevrolet, Ford, Dodge, Hudson-Essex and Overland, for example, all have well over 75 per cent of their retail outlets in towns of less than 10,000 population.

But the records indicate that successful distribution of the middle and high priced lines depends also on having a relatively large number of small town outlets. Buick, Studebaker, Chrysler and Nash, for instance, to name a few examples of outstanding successes, all have the proportion of their dealers in small towns almost equal to the similar percentages for the lower priced lines.

True Also of Highest Priced Group

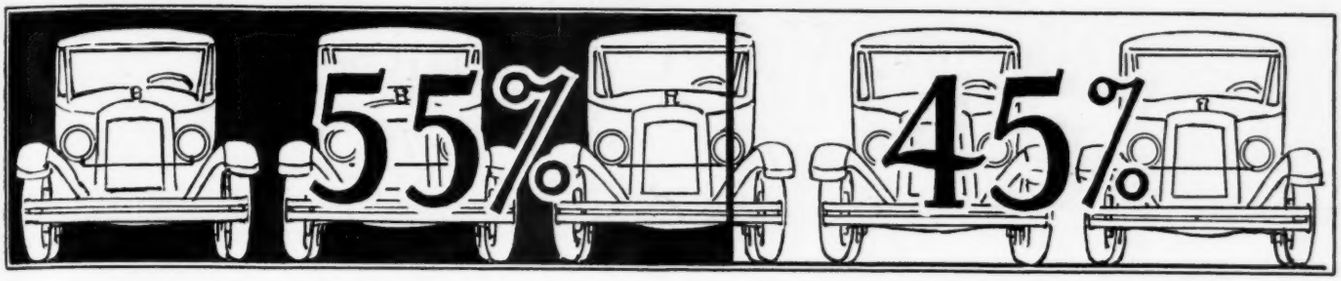
Even in the highest priced group, analysis shows that those companies which lead in production lead also in proportion of dealers in small towns. There are some variations and exceptions to this rule, of course, since percentage of dealers in small towns, obviously, is only one of a number of factors influencing the success of a manufacturer. But it is significant that the four makers of high priced cars which had the largest production last year are the same four which have a larger percentage of their retail outlets in small towns than any of the other companies in this competitive group.

And proper utilization of these small town outlets is growing in importance every year due to the changing trend in buying habits which gradually is taking place in this country. Not so many years ago, the small town inhabitant expected to make a journey to the nearest large city in order to purchase any item of importance. Buying never had been made very convenient for him and he was used to making a definite effort when purchases of any real value were to be made. As a result he didn't buy nearly as much as he does today.

Competition in all lines gradually resulted in manufacturers of certain products increasing their distribution outlets so that it became much easier and much more convenient for this small town dweller to buy things. He didn't have to get organized several days in advance to make a trip to the big town to buy a piano or a sewing machine or a phonograph. The automobile itself was an important agent in bringing the small town in closer touch with the city, making the small town man more familiar with the products for sale in the city and making him more eager to have those products where he could select and choose them at his convenience.

Gradually his buying habits began to change. He found more and more manufacturers making it possible for him to buy without the slightest effort on his own part. In

Passenger Car Registration in United States



—In Towns of Less Than 10,000 Population

—In Towns of More Than 10,000

many cases, products were offered to him at his door and delivered to him on the payment of only a small sum down. He became used to thep rocess of being sold; he got out of the habit of having to exert himself in buying.

This change has been going on for some years; gradually it is extending. And automobile manufacturers, recognizing the trend, are seeking to fit their marketing plans and retailing organizations to the new needs of distribution.

The necessity for adequate service facilities, after the owner has bought a car, also is becoming more apparent to car owners as they get their second, third or fourth vehicle. The repeat buyers, of which there are more every year, look to the probable service facilities they will get with a car far more than does the average man buying his first automobile. Even for a purchase so large as a motor vehicle, the small town man today is reluctant to buy at a point very far from his home, because he wants readily available some one to give him service and some one who has a permanent interest in the car which he has bought.

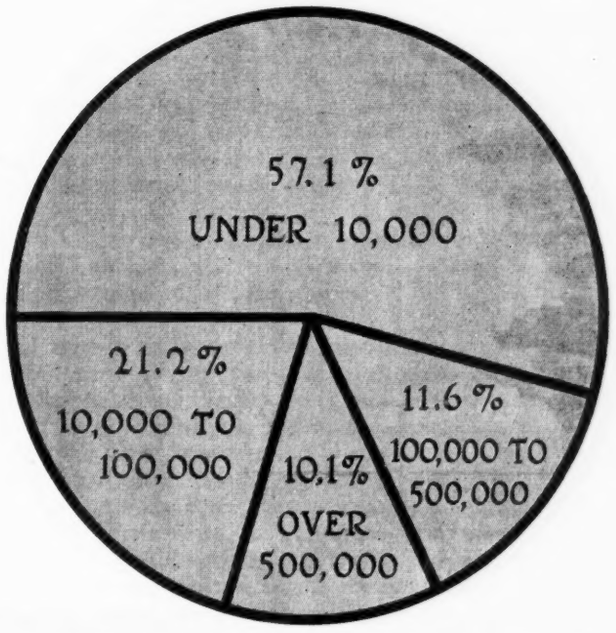
Adequate small town representation is not easy to get. Manufacturers, especially those selling cars above the lowest price group, have been struggling with the problem for several years, some with more success than others. Selling to these outlying territories is certain to be more expensive than in the larger centers where a great number of prospects are concentrated within a smaller area. On the other hand, the largest number of potential buyers, as shown by the figures given, is in the smaller towns and rural areas. And the car builder who make it most convenient for people in these areas to buy his product and who provides the best service for it after it is sold almost certainly will increase his business the most rapidly. That this theory is sound is indicated clearly by study of the facts and figures already presented and illustrated in the accompanying charts.

Changing Trends in Buying

Commenting on some of the broader phases of these changing trends in buying recently, Leon Banigan said in *Motor World Wholesale*: "Automotive marketing today is a laboratory of causes and effects. Nothing is fixed. Routine, without day to day observance of conditions and systematic and thorough search for facts is costing millions of dollars annually. Routine and hunch marketing were good enough when the world was clamoring for automotive products and production to meet that demand was the all important thing. But today, with factory capacity equal to or in excess of demand, the necessity for intelligent and thorough study of marketing principles and practices is paramount."

That 1926 is a particularly good time for the vehicle manufacturers to put special effort on small town and rural marketing problems is supported by the current

Automobile Service Stations in Towns of Various Sizes



prosperity of the farmer as well as by the more general trends just discussed. While some unfavorable factors have influenced the winter wheat crop in certain sections, the farmer generally speaking has fewer debts, more money in the bank and better prospects for future prosperity than at any time in the last few years.

"The relative advantage of the industrialist over the agriculturist in purchasing power seems about to come to an end," is the interesting statement made in a recent bulletin of the *United Business Service*. As a result of a study of price movements over a period of years, this bulletin predicts three probable results:

"1. The next few years will be relatively better for the agriculturist than for the industrialist.

"2. The cost of food for the industrial worker will rise, leading to labor discontent and agitations for wage increases.

"3. After the more favorable position of the agricultural worker has been demonstrated by a couple of years' experience, we will probably see another 'back to the land' movement, which will create a new demand for farm lands."

If this analysis is borne out in any general sense, those small towns which depend largely upon the patronage and support of the farmer for their prosperity seem likely to see relatively good times in the next twenty-four months.

Sleeve Valve Engines—

Elements of Design and Performance Characteristics

Out of many designs only two have continued to be built. Review of history, design and performance of Knight and Burt engines.

PART 1

*By P. M. Heldt**

OF the many types of sleeve valve engine on which patents have been taken out and on which experimental work has been done, only two have come into extensive commercial use, the double-sleeve type invented by Charles Y. Knight and the single-sleeve invented by P. Burt.

Knight was the pioneer of the sleeve valve. He began his work along this line in Chicago in 1905 and built a car equipped with his engine. At that early period in automobile history the great majority of poppet valve engines were very noisy in operation, even though their operating speeds were very moderate compared with present day standards. The points in the design of cam mechanism which make for silent operation were not well known as yet, in addition to which the central portion of the valve train, including the gap between the valve stem and tappet, were always exposed. In fact, in the British Daimler poppet-valve engine, which was the first to be replaced by the sleeve-valve type, the cams themselves were located outside the crankcase, so that the benefit of an oil cushion on the contacting surfaces was not obtained. Knight's primary object was to render the engine more nearly quiet in operation, by making the valve action positive, and he emphasized this by referring to his engine as the Silent Knight.

Attempts to interest American automobile manufacturers in the engine having failed, Mr. Knight went abroad and succeeded in selling his British rights to the Daimler Motor Co. of Coventry, England, which was originally organized some 13 years earlier to exploit the patents of Gottlieb Daimler in England.

Daimler Adopts Knight Engine

At the time when it became interested in the Knight engine, the Daimler Motor Co. occupied an important position in the British motor industry, having been for some years the largest producer of large, expensive cars. At the same time, or a little later, the Daimler Motor Co. of Cannstadt, often referred to as the Mercedes concern, secured the German rights, the Minerva Co. of Antwerp, the Belgian rights and Panhard & Levassor, of Paris, the French rights.

These various firms all were preeminent in the automobile industries of their respective countries, and their decisions to adopt the Knight engine naturally created a deep impression throughout the automobile world. The British concern decided to give up the poppet valve engine entirely, and exhibited at the London Show in the fall of 1908 three models fitted with Knight engines, while the German Daimler and the Panhard firms adopted the sleeve valve engine for part of their production only. Knight also disposed of his rights in Austria, Switzerland and Italy to established automobile concerns, but these latter never figured as prominently in the world's markets as did his British, German, French and Belgian licenses.

After his striking success in Europe, Knight returned to this country and sought to interest four makers of cars in his patents, the plan being to license four companies, instead of a single one, as in each of the European countries. The four licenses were eventually placed with the F. B. Stearns Co., the Columbia Motor Car Co., the Stoddard-Dayton Motor Car Co. and the Moline Automobile Co. Recently these four licenses have been controlled by the Willys-Overland Co., the F. B. Stearns Co., the Sterling-Knight Co. and the Yellow Sleeve Valve Engine Works.

The largest producer of Knight engines in this country has been the Willys-Overland Co. Up to recently this concern turned out a four-cylinder car with sleeve valve engine, while at present it is producing two Knight-engined sixes. The four-cylinder Knight engines of the Willys concern are being used also in commercial vehicles, on light trucks built by the Federal Motor Truck Co.

The Yellow Sleeve Valve Engine Works, Inc., which are successors to one of the original Knight license holders, the Moline Automobile Co., have been building Knight sleeve-valve engines for the Fifth Ave. Bus Company of New York since 1915 and at present are manufacturing bus engines for the Yellow Truck & Coach Manufacturing Co. All of these companies are now under the control of General Motors Corp.

Knight's striking success caused many other inventors to turn their attention to positively operated types of engine valve, and during several years from 1910 on there was a regular flood of sleeve, rotary and piston valve engine, or engines with positively operated valves. A few of these engines were backed by plenty of capital and engineering talent, and some of them, like the Itala rotary valve engine and the Mead used for the Speedwell car built in Dayton, O., were manufactured for a number of years, but so far as the author knows the only other non-poppet valve engine that has endured is the single-sleeve valve engine of Burt and McCullum, which has been manufactured since 1911 by a Scottish firm, the Argyll Motor Car Co., of Alexandria, near Glasgow.

Recently the Vauxhall Co., another old established firm in the British motor car industry and which is now controlled by the General Motors Corp., has taken up the Burt engine, which has also been manufactured on a small

* From a paper presented at the February meeting of the Dayton, Ohio, Section, S. A. E. Part II will appear in an early issue.

scale by Picard & Pictet, of Geneva, Switzerland, for use in a car known as the Pic-Pic, and by the French racing driver Guyot. The American rights to this engine have been acquired by the Continental Motors Corp., and one therefore does not have to be much of a prophet to foresee for it an important role in American automotive development during the next few years.

As regards the patent situation, it may be pointed out in passing that shortly after the single sleeve valve engine was placed on the market in Great Britain, there was a patent contest between Knight and Argyll, but it was held by the Judge before whom the case was heard that the Burt engine was not an infringement of the Knight patents. The first of the Knight U. S. patents will expire on August 23, 1927, but there are a number of other patents and the author does not believe that the double sleeve valve field will be thrown wide open on that date.

Among other sleeve valve engines on which patents have been taken out may be mentioned one with a rotary sleeve, patented by Renault in France, but which was never placed in production. A similar engine was under development in this country during a period of several years, but no serious efforts were ever made to manufacture it. The single sleeve between cylinder wall and piston was rotated by helical gearing at one quarter crankshaft speed.

Valve Action

Although the Knight engine is generally well known, its principal features may be pointed out briefly. Referring to Fig. 1, the valve functions are performed by two concentric, ported sleeves, generally of cast iron, which are inserted between the cylinder wall and the piston. The sleeves are given a reciprocation motion by connection to an eccentric shaft driven from the crankshart through the usual two-to-one gear, their stroke in the older designs, at least, being either 1 in. or 1⅛ in. The sleeves, of course, project from the cylinder at the bottom, and at the top they extend into an annular space between the cylinder wall and the special form of cylinder head, so that during the compression and power strokes the gases do not come in contact with the cylinder wall, but are separated therefrom by two layers of cast iron and two films of lubricating oil.

The cylinder, as well as each sleeve, is provided with an exhaust port on one side and with an inlet port on the opposite side. The passage for either the inlet or exhaust is open when all three of the ports on the particular side are in register.

The valve or port action of such an engine can be studied to advantage by means of a sleeve motion diagram such as shown in Figs. 2 and 3. The curves can be laid out with the aid of the formula for crank train motion, but in order to secure the necessary degree of accuracy it is well to lay them out on an enlarged scale, and account must be taken of the fact that whereas the strokes of both sleeves are alike, the lengths of their connecting rods are different.

The inlet begins to open when the bottom edge of the port in the outer sleeve, moving downwardly, passes the top edge of the port in the inner sleeve, also moving downwardly but at a slower rate. The inlet port closes when the bottom edge of the port in the inner sleeve, moving upwardly, passes the top edge of the port in the outer sleeve, also moving upwardly. This passing of the edges of the ports in the sleeves takes place while they are opposite the inlet port in the cylinder wall. The inlet ports of the two sleeves also come into registry about 360 deg. of the crank motion later, when the piston has started on its power stroke, but these ports are then high up between the cylinder head and cylinder wall, and the port in the inner sleeve is sealed by the junk ring in the cylinder head.

Combustion Chamber Shape

One advantage of the sleeve valve engine that is immediately apparent upon an inspection of the sectional view is the favorable form of the combustion chamber. Of the heat energy released by the combustion, a large proportion ordinarily passes into the cooling jacket, and this proportion naturally varies with the ratio between the cooling area and the volume of the combustion chamber. It is particularly important to have the cooling area as small as possible during the early part of the power stroke, as it is then that the working fluid is at its highest temperature and looses energy to the jacket most rapidly.

The most favorable form of combustion chamber from this point of view is a sphere, and in the Knight engine with its domed cylinder head and the dished piston head used in some designs, the spherical form is approached more closely than in any other type of engine, even more closely than in engines with valves in the head set at an angle, as these usually have plane piston heads. Determinations of the percentage of the heat energy passing into the cooling water in Knight engines have confirmed this conclusion based on theoretical considerations. Measurements made by Prof. Riedler of the Charlottenburg Technical College on three different models of sleeve valve engine, showed the loss to the water jacket to be from 19.5 to 25.8 per cent, whereas the lowest loss to the jacket measured on poppet valve engines by the same investigator was 30.7 per cent.

Of course, it must not be assumed that all of the reduction in the loss to the water jacket is added to the

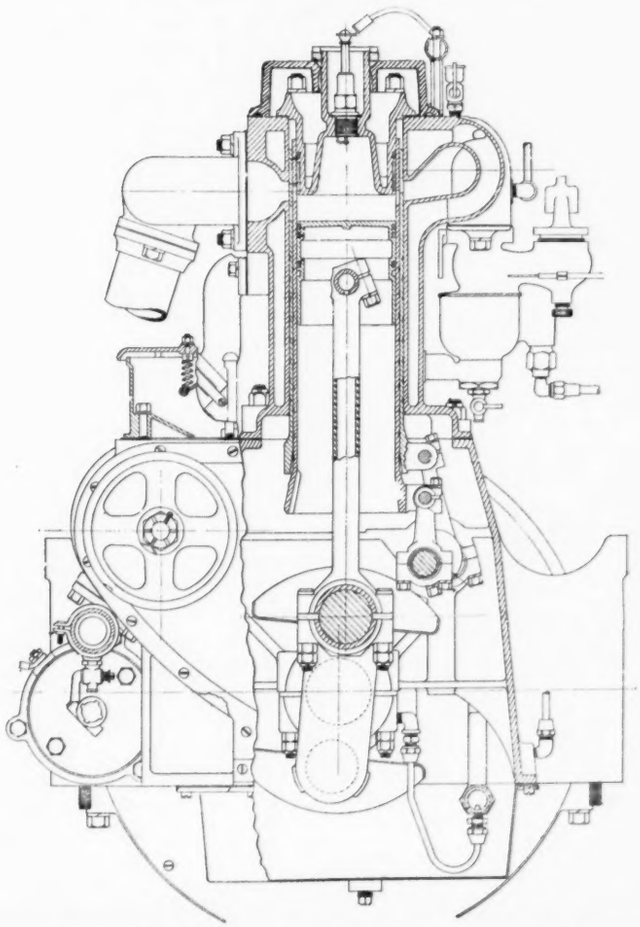


Fig. 1—Section through Knight sleeve valve engine cylinder

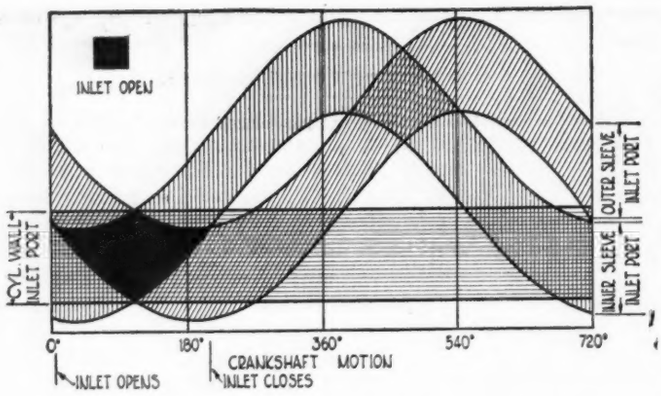


Fig. 2—Inlet port opening diagram for Knight sleeve valve engine

useful output of the engine. If the cooling area is small, the heat is retained in the cylinder; this helps to maintain the pressure throughout the stroke and thus add to the output of mechanical work, but there is also more heat energy left in the gases at the end of the power stroke, which is discharged with the exhaust.

Conservation of heat in the working fluid during the power stroke is due not only to the relatively small extent of the combustion chamber wall surface, but also to the special character of this wall surface, which makes heat flow through it more difficult. At the beginning of the power stroke, which is the most important point from the standpoint of heat loss to the jacket, less than half of the combustion chamber wall surface is directly water-cooled, this being the under side of the cylinder head. The piston head, which forms a greater percentage of the total wall surface than in most engines because of its dished form, is far removed from the jacket water, measured in terms of resistance to heat flow. Comparatively little of the inner sleeve is exposed to the working fluid at this time, but whatever heat this surface absorbs must pass through three thicknesses of metal and two films of oil before it reaches the water. Just how much this insulating effect, particularly of the oil films, retards the heat flow can only be conjectured, but it is undoubtedly a factor in the reduction of the full load jacket losses in the Riedler test from an average of about 34 per cent in poppet valve engines to an average of 23.5 per cent in sleeve valve engines.

Permissible Compression

The slower rate of heat flow to the jacket might be expected to have undesirable results in causing overheating, with its associated troubles of faulty lubrication, pre-ignition and detonation. In the conventional engine there are three points that usually reach temperatures above the average of the combustion chamber wall, namely, the exhaust valve head, the spark plug, and the piston head. In the sleeve valve engine there is no exhaust valve head to cause trouble. The spark plug is usually well cooled, being screwed into a boss located centrally in the cylinder head and completely surrounded by water. Thus there remains only the piston head, and no particular difficulty seems to be experienced in keeping this below the temperature at which danger of self-ignition begins. The suggestion has been made that, owing to the restrictions in the paths of heat flow, it might be necessary to operate sleeve valve engines at lower compression, but the compression ratios actually used are substantially the same as those used in poppet valve engines. Thus various Stearns models have compression ratios of 4.5, 4.6 and 4.9 and the Sterling-Knight of 4.5. In the Vauxhall single sleeve valve engine the volumetric compression ratio is 5, which is probably higher than the ratio used in any other automobile engine.

In the earliest Knight engines there was evidently some trouble from inadequate cooling, or at least the designers felt they had to provide against such trouble. Refuge was had to an expedient which is also made use of in air-cooled engines, that of restricting the inlet passage at some point, so that the maximum rate of charge flow occurs at a comparatively low engine speed. Thus in a Coventry Daimler engine investigated by Prof. Riedler the carburetor choke had a cross-section area of only 2.05 sq. in. while the full opening of the inlet port was substantially 4 sq. in. This for an engine with 4 by 5 inch cylinders.

Carbon Deposits

It also has been claimed for the sleeve valve engine that it is free from carbon troubles, but just why this should be so has never been clearly explained. The claim was bolstered up by the reports on both the Royal Automobile Club and the Automobile Club of America endurance tests (to which reference will be made later) in which statements occurred to the effect that examination of the working parts after the tests had shown practically no carbon accumulations.

Since these tests were made, a lot more experience has been accumulated, however, and it is now fairly evident that what was then taken to be a characteristic of the sleeve valve engine was probably more a characteristic of the particular oiling system used. That sleeve valve engines will form carbon deposits in the combustion chamber is evidenced by the fact that one manufacturer of such engines issues very specific instructions regarding carbon removal. The carbon must under no circumstances be burned out, as this may injure the sleeves, and it must not be scraped from the sleeves, because carbon on the sleeves is said to be an advantage. One other consideration which is not mentioned but which may have had an influence in making the recommendation is that scraping off carbon would not improve the seal of the sleeves nor their bearing characteristics. Of course, this practically amounts to saying the same thing in other words.

Aside from the tests made on sleeve valve engines by Prof. Riedler and reported by him in his book on "The

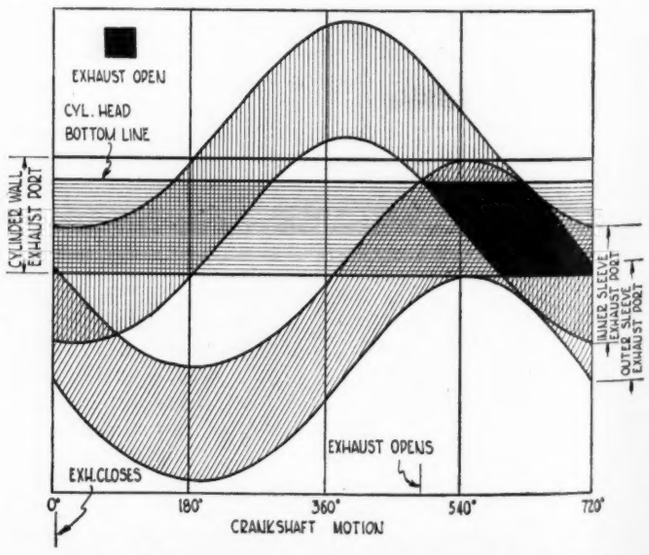


Fig. 3—Exhaust port opening diagram for Knight sleeve valve engine

Scientific Determination of the Merits of Automobiles," there have been at least three extended, searching public tests of the Knight engine, the results of which should constitute a reliable guide in judging its performance characteristics.

Endurance Tests of Knight Engines

The first of these was conducted in 1909 by the Royal Automobile Club of Great Britain on a four-cylinder Daimler engine of 96 mm. bore and 130 mm. stroke (about 3¾ x 5 in.). The engine was run on the bench continuously for 5 days, 12 hours and 58 minutes at a piston speed of 1,000 ft. p. m. (which was about normal at that period), developing an average of 38.83 hp. According to the rules of the test the output was to be more than 1.3 times the horsepower rating under the R. A. C. formula, this rating being 22.85 hp. The fuel consumption was at the rate of 0.668 lb. p. hp. h. Two stops of a total duration of 17 minutes were made, but they were such that no penalty was incurred.

At the completion of this test the engine was put in a car and driven a total of 2,143 miles, mainly on Brooklands track, at an average speed of 41.88 m. p. h. The weight of the car with load was a little over 3300 lb. during some of the runs, and 3600 lb. in others. This was followed by a final bench test of 5 hours' duration, in which the engine developed an average of 38.96 hp. (slightly more than in the earlier test) and consumed an average of 0.677 lb. p. hp. In their report on the tests the judges remarked that at the conclusion of the final bench test the engine was dismantled and no wear on any of the fitted surfaces was perceptible. The cylinders and pistons were found to be notably clean. The ports of the valves showed no burning or wear.

The second test referred to was made on a Moline-Knight four-cylinder 4 by 6 in. engine at the Automobile Club of America late in 1913. This engine, unlike the earlier ones of the Knight type, had full force feed oiling, even up to the piston pins, through the holes in which oil was fed to the piston guide.

The engine was run continuously for 336 hours (14 days) under full open throttle and with set spark. The average speed during this long run was 1,117 r. p. m., and the average brake load 36.5 hp. At the end of the endurance run the speed was increased and the engine developed 53 b. hp. for a period of one hour at an average speed of 1,678 r. p. m.

Fuel Efficiency Test

In a special 5-hour run made for the determination of fuel efficiency, the fuel consumption was at the rate of 0.63 lb. p. hp. h., with an engine output of 39.8 hp. at 1,114 r. p. m. The volumetric efficiency when running under full throttle was determined to vary from 78 per cent at 900 r. p. m. to about 70 per cent at 1600 r. p. m.

Regarding the condition of vital parts of the engine at the end of the test, the report stated that these were, "without exception, in excellent condition. There was no percepible wear on the bearings, sleeves or other parts. The slight irregularities in the sleeves were built up with carbon to form close-fitting, glossy surfaces. The ports in the sleeves were not burnt, and there was only a very slight deposit of carbon on the port edges. The cylinder heads and the tops of the pistons showed only a very thin coating of carbon, and only small quantities of carbon were found elsewhere. No shake could be found in any bearing, and there was every indication of perfect lubrication. . . . . ."

The most recent test of a Knight engine under severe conditions was of a Panhard-Knight aircraft engine by the French Air Service in a competition in which prizes to the amount of two million francs were offered by the Under-Secretary for Air. A twelve-cylinder Panhard-Knight was one of the thirteen engines entered and one of the four which completed it successfully, and this is one of the first sleeve valve engines ever built for aircraft purposes. In this test a limit of 7.25 lb. was placed on the weight per brake horsepower, inclusive of fuel, oil and water sufficient for a five-hour flight.

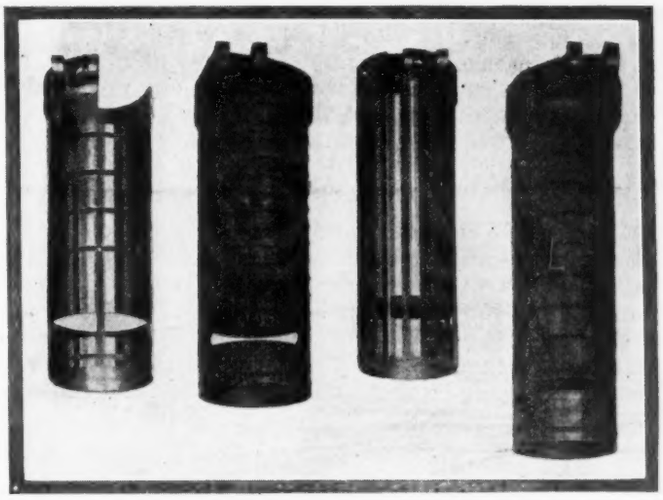


Fig. 4—Comparison of Panhard cast iron and steel sleeves

A few data concerning this engine may be of interest. The twelve cylinders have a bore of 140 and a stroke of 170 mm. and are arranged V-fashion with an angle of 60 deg. between the two sets. The volumetric compression ratio is 5.4, which is about the same as that used with other aircraft engines designed to operate on aviation gasoline. One eccentric shaft is provided for each of the two sets of cylinders. Starting is by compressed air admitted to the cylinders through a distributor mounted on the engine. The rated output is 550 hp. at 1800 r. p. m. and the weight in running order, 1,155 lb. or 2.1 lb. p. hp.

Port Opening Area

From the beginning one of the foremost claims for the sleeve valve engine has been that the sleeve type of valve permits of much greater port openings and of more rapid opening and closing of the ports. In view of this claim it is rather strange that sleeve valve engines have not been more of a factor in speed contests. In fact, up to the time of the recent Panhard and Voisin successes on the Monthlery track in France, all speed records stood to the credit of the poppet valve engine.

The explanation undoubtedly is that exceedingly large valve capacity can be obtained with poppet valves if quiet valve action is not a consideration. An investigation made in connection with the development of the Liberty aircraft engine showed that, whereas a poppet valve theoretically attains its maximum capactiy when the lift is made equal to one-quarter the clear diameter, actually the capacity corresponding to such a lift is only about two-thirds the maximum, and the flow through the valve will increase with the lift far beyond this point.

Now, in passenger car engines, owing to the requirement of silent operation, the list is generally made materially less than one-quarter the clear diameter, and, moreover, the valve is lifted very gradually. In racing engines, on the other hand, the height and rate of lift are made as great as the physical qualities of the material

affected will permit of, and this permits of a large increase in output.

At moderate speed the specific output of sleeve valve automobile type engines is apparently about 15 per cent greater than that of poppet valve engines. The torque curve of a Yellow Sleeve Valve six-cylinder 4¼ by 5½ in. bus engine, which has been furnished the author by the manufacturer, shows a brake mean effective pressure varying from 107 lb. p. sq. in. at 800 r. p. m. to 80 lb. p. sq. in. at 2250 r. p. m., the speed of maximum output. This compares with a brake m. e. p. range for the average passenger car engine of from 85 to 70 lb. p. sq. in. On the other hand, aircraft engines, and presumably racing automobile engines also, develop a higher brake m. e. p. than 107 lb. p. sq. in.

Timing of Sleeve Valves

It is worthy of note in this connection that Knight sleeve valve engines generally have a more extreme timing than poppet valve engines; that is, the lead of the exhaust valve opening and the lag of inlet valve closing are greater. In the Yellow Engine Co.'s bus engine, for instance, the exhaust opens 52 deg. ahead of bottom dead center and the inlet closes 60 deg. past bottom dead center, while the exhaust closes 11 deg. past top dead center and the inlet closes 7 deg. past top dead center.

In addition to the large port openings obtainable, the short and direct path of the incoming and outgoing gases should be a factor in enabling the sleeve valve engine to maintain its volumetric efficiency at high speed. It is a well-known fact that any bends in a passage through which there is a rapid flow, always introduce a considerable resistance to the flow, as at such turns or bends eddies are formed which cause a part of the nergy of the flow to be dissipated.

One thing that distinguishes the sleeve valve from the more conventional type of engine is that its valves are positively operated and that the valve timing therefore is absolutely independent of the speed. However, with cast iron sleeves it was impossible to take full advantage of this feature, owing to the great weight of the sleeves and the consequent great inertia forces. This is true more particularly when speeds such as 4,000 r. p. m. are considered, which are now freely spoken of in connection with stock models in Europe.

The cast-iron sleeves of the several engines on which test results are quoted in this paper weighed from 8 to 9 lb. each. Probably another pound can be added to allow for the inertia and centrifugal forces on the "eccentric" rod. Now, the maximum inertia forced on a reciprocating weight of 10 lb. having a stroke of 1 in. at 2,000 r. p. m. of the eccentric shaft (corresponding to an engine speed of 4,000 r. p. m.) would be about 700 lb., which would be rather great for the small bearings of the eccentric rods. Moreover, the sleeves are not in mechanical balance, as will be shown further on.

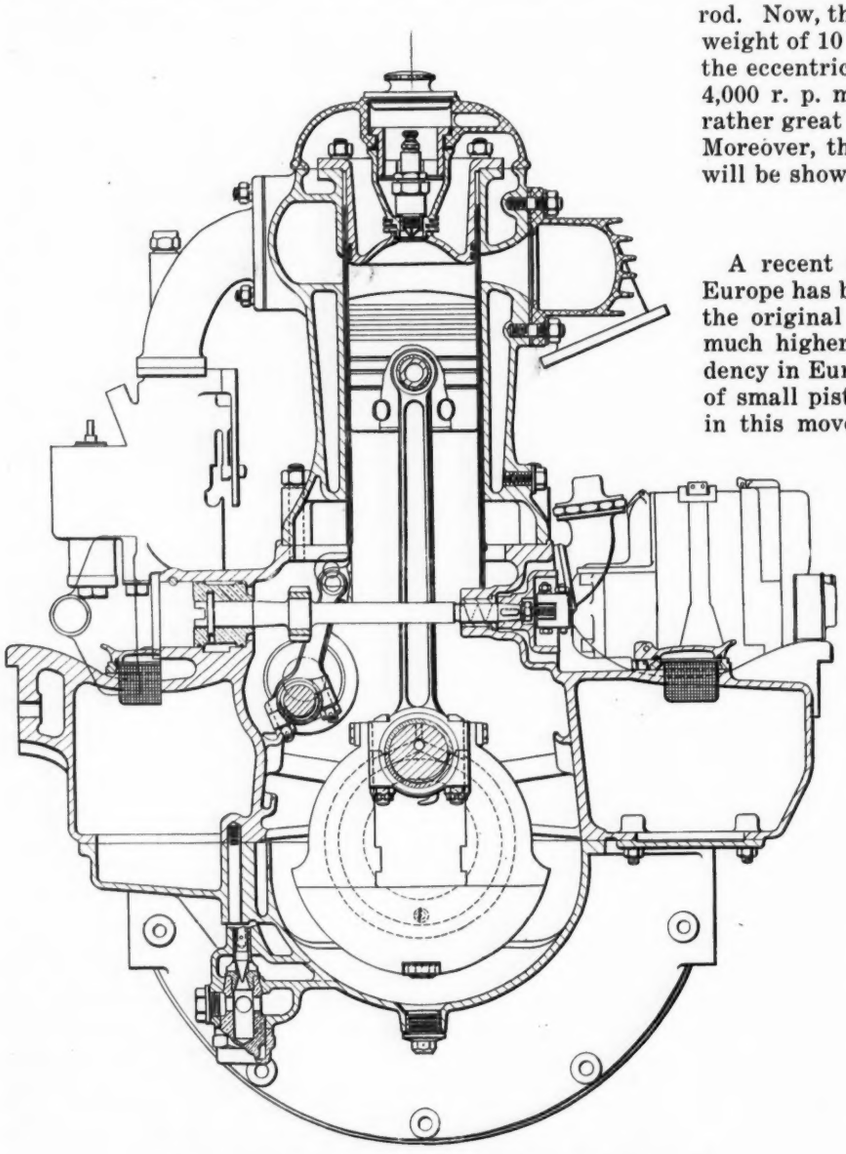


Fig. 5—Cross section of Panhard Knight 10 hp. passenger car engine

Steel Sleeves

A recent development in Knight engine practice in Europe has been the substitution of light steel sleeves for the original cast-iron sleeves, which has made possible much higher engine speeds. As is well known, the tendency in Europe for many years has been toward engines of small piston displacement and high piston speed, and in this movement the Knight licensees could not compete successfully as long as they stuck to the cast-iron sleeve.

The Panhard firm in France developed and patented a design embodying light steel sleeves, which are used in both the aircraft engine and in their passenger car engines. The sleeves are made of high tensile steel, and very thin (1.5 mm. as compared with 4 and 5 mm. in cast iron). In the older Panhard-Knight engines, as well as in others of the type, the combustion chamber is sealed at the top by a single wide junk ring, and according to the Panhard engineers, the very width of this ring made it difficult to effect a good seal. In the new design four very narrow rings are used, and this made it possible to greatly widen the ports and thus to enlarge the port capacity. In the inner steel sleeves the ports are divided by numerous narrow bridges, so there is no possibility of the rings on the cylinder head catching in them.

The limitations on the width of the ports having been removed, it is possible to maintain a high volumetric efficiency up to very high speeds, and in bench tests the so-called 20 hp., a four-cylinder engine of 105 mm. bore and 140 mm.

stroke is said to have delivered nearly 200 hp. at 3,400 r. p. m. At 1,000 r. p. m. the output is said to be nearly 12 hp. p. liter (16 cu. in.) of displacement.

Owing to the fact that steel on steel does not give a good bearing, the outer sleeves are provided with a very thin lining of white metal, which is applied to the sleeve by a centrifugal casting process. The Minerva Company of Belgium, which has been experimenting with an eight-cylinder Knight aircraft engine, uses an outer sleeve of bronze together with an inner sleeve of steel.

Junk Rings

It is the writer's opinion that the wide junk ring on the cylinder head of Knight engines will eventually be dispensed with altogether. It was used by Knight because he employed ports in the valve sleeve of very great circumferential width, and a narrow ring would have dropped into these ports, as it were, or would have caught on the edges, with destructive effects. Bridges in cylinder wall ports were commonly used at that time in two-stroke engines, and had been used also in auxiliary exhaust ports at the bottom of the stroke in four-stroke engines, but Knight evidently feared that such bridges in the thin inner sleeve without direct water cooling would give trouble from overheating. Recent experience, however, has shown that there need be no such trouble.

Various modifications of the original form of junk ring have been made. Thus some manufacturers have used a wide outer ring of compartively small radial thickness, which was pinned, so that its gap could not come opposite the ports in the inner sleeve, and under it a number of narrow, stiffer rings, which furnished practically all of the spring force. In the Willys-Knight engine a wide junk ring with internal flanges is being used. I understand that the chief reason for this construction is that it reduces wear on the sides of the ring grooves in the cast aluminum head, the lateral thrust on the ring being taken up by four or five instead of a single thrust surface.

When the limitation placed by the junk ring on the width of the ports is removed, the valve capacity can be greatly increased. In the older Knight engines, with a stroke of about 5 in., the width of the ports generally ranged between the limits of ½ and ⅝ in. If several bridges and narrow rings are used, this can be increased by at least 50 per cent and possibly doubled. Of course, the stroke of the sleeves has to be increased in the same proportion, and probably the real limit to the speed in such an engine is the inertia of the sleeves, which increases with the stroke.

A problem that deserves consideration when very high speed of operation is contemplated is that of the balance or unbalance of the sleeves. The dynamic forces on the pistons and connecting rods are the same in a sleeve valve as in a poppet valve engine, and need not be considered here, but the sleeves introduce a new element of unbalance which cannot be entirely neglected.

We know that in the conventional four-cylinder engine the primary components of the unbalanced forces on the pistons and similar parts neutralize each other, because the two end pistons (Nos. 1 and 4) move up and down together and pistons Nos. 2 and 3 also move up and down together and always in opposition to pistons Nos. 1 and 4. Piston No. 4 follows piston No. 1 in its motion at a time interval corresponding to 360 deg. of crankshaft motion, and every phase of the cycle in Cylinder No. 4 is behind the corresponding phase in Cylinder No. 1 by this time interval. But 360 deg. of crank motion is the same as 180 deg. of eccentric shaft motion. Therefore, each sleeve in cylinder No. 4 follows the corresponding sleeve in cylinder No. 1 at a time interval corresponding to 180 deg. of eccentric shaft motion. From this it is evident that when one of the sleeves in No. 1 cylinder is at the bottom of its stroke, the corresponding sleeve in No. 4 cylinder is at the top of its stroke. The primary unbalanced forces on these latter two sleeves are a maximum at this moment, and though they are opposite in direction they cannot neutralize each other because of the fact that they act along parallel lines at a considerable distance from each other. The result is that a rocking couple in a vertical longitudinal plane is introduced. At the same time the primary components of the unbalanced forces on the reciprocating parts of cylinders Nos. 2 and 3 are nil.

Fig. 5—Sectional view of Willys-Knight engine, showing pistons, sleeves, cylinder heads, the unusual type of junk ring, separate cylinder and water jacket heads and the spark plug located in a well

On the other hand the secondary components of the unbalanced forces, which are the chief cause of vibration in a four-cylinder conventional engine, are neutralized in the case of the sleeves. It was stated above that the primary component of the unbalanced force on a sleeve in No. 4 cylinder lagged behind the same component of the same force in No. 1 cylinder by a time interval equal to 180 deg. of eccentric shaft motion. Now, the secondary component has twice the frequency of the primary component. That is, during the same time that the primary component passes through 180 deg. or half a cycle, the secondary component passes through a complete cycle. Hence the secondary component of the unbalanced force on a sleeve in No. 4 cylinder lags a whole cycle behind the same component of the same force in No. 1 cylinder, and therefore is in phase with it. The same relation therefore exists between the secondary components of the unbalanced forces on the sleeves in the different cylinders of a four-cycle engine, as between the primary components of the unbalanced forces on the reciprocating parts of the piston train, and these secondary components neutralize each other.

Bohn Alloy Piston Employs Struts; Has Low Expansion Rate

Steel or invar alloy struts cast into the piston pin bearing bosses reduce expansion to that obtained with cast iron. Interchangeable bronze backed bearing introduced.

By Walter L. Carver

TWO engine components have been placed in production by the Bohn Aluminum and Brass Corp., a completely interchangeable bronze-back, babbitt-lined bearing, and a Nelson-type aluminum alloy piston, in which latter the expansion difficulties ordinarily associated with light alloy pistons have been eliminated.

Complete interchangeability of the bearing is obtained by controlling the composition of both bronze back and babbitt lining to a close degree and by a routine of finishing operations in which the shells are held in the same manner as when in service in the engine. The bronze shell has a high copper content, and both the composition and the temperature at which the heats are poured are held within very close limits, so that each batch will have the same physical characteristics as every other.

In accordance with the usual practice in this field, most of the machining operations are performed on oversized blanks, before the splitting operation. In this case all of the roughing operations precede the finish-grinding of the outer surface and the casting of the babbitt lining by the centrifugal process. A tin bonding operation precedes the babbitting.

Babbitt consisting of 85 per cent tin and 7.5 per cent each of copper and antimony, is poured in to a considerable thickness while the shell is rotated. This process insures the absence of blow-holes in the bearing proper after the babbitt has been machined out to a thickness of approximately 1/32 in.

Following the rough-machining of the babbitt, shells are split and formed, being held in this and all subsequent operations in such a way that the conditions of actual operation are simulated. The ground back insures close contact with the bearing seat in either cap or case, and thus insures better transmission of the heat generated in the bearing and longer life than if any slight localized clearances existed. In the same way, the distance from the ground back to the joint faces is held very closely and the total thickness of the shell is gaged at all times from the ground back.

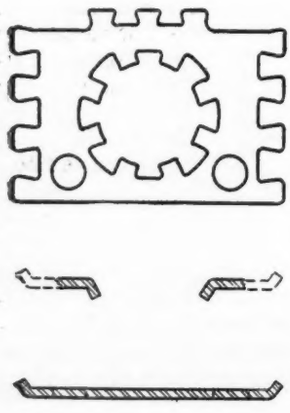


Fig. 1. Strut used in Nelson type piston. Made of steel or invar alloy. Dovetail projections lock into aluminum casting

Tolerances on the shell thickness and on all diameters are .00025 in. and those on lengths, .001 in. The final operation, after the bearing is otherwise completed, is the finish broaching of the babbitt lining, whereby the latter is compressed slightly and a mirror finish is produced. It should be understood that this operation follows all others, including the drilling of the dowel holes, milling of oil grooves, etc.

Thicker Bronze Shells

These bearings are designed to suit individual installations and already are standard in egines of the following cars: Oakland and Pontiac, Chrysler sixes, Wills St Claire six, Willys sixes, Studebaker and others. The trade name of the bearing is Ring True. In connection with the design for individual installations, Bohn engineers state that a considerable tendency toward thicker bronze shells is shown at the present time.

In conjunction with the limits on the crankshaft, these bearings are designed for an oil clearance of .001 to .003 in.

In the Nelson type aluminum piston the rate of heat expansion is reduced by the use of a strut of either steel or invar alloy. In this design, which is the outgrowth of a number of years of effort on the part of A. L. Nelson, whose earlier designs have been described in *Automotive Industries*, a stamped strut is cast into each of the two piston bosses, and these form the only connections between the head and skirt portions of the piston. Otherwise the design of the piston is conventional, the material, known as Bohnalite is an alloy of aluminum, copper and magnesium.

Fig. 1 is a typical strut, while Fig. 2 shows the application of the strut construction to the piston of the Chrysler 80 and Fig. 3 shows the strut in place in the piston of the Star four-cylinder engine. In the first case, the struts are stamped from invar alloy and in the second from hot rolled pickled steel. As shown, the struts are formed with dovetailed projections at each end and at the middle portion of the top. Similar projections are formed at the

large center hole. The projections at the ends are bent over to conform with the curvature of the piston skirt, while those at the center hole are bent similarly to produce greater locking action.

In the manufacturing process, the struts are preheated slightly and then are placed in the permanent molds before the metal is poured. The piston boss is joined to the head and ring portion by a fairly heavy rib which envelopes the central section of the strut. The stamped lugs at the center are turned outward and clear the pin bearing bore. These lugs also are arranged so that they do not interefere with the drilling of any oil holes in the boss. Between the center portion and the ends cast into the skirt, a section of the strut is visible. By means of the usual saw slots below the lower ring, the head section of the piston is completely separated from the skirt, therefore the struts unite the two portions of the piston.

Struts Determine Heat Expansion

It will be noted that the struts are placed in the direction of the resultant thrust on the piston skirt and comprises the major portion of the structure of the pistons in this direction. As result of this arrangement, the heat expansion of the piston operation is determined almost exclusively by the struts. Experiment has shown that with the steel strut, as used in the Star piston, the coefficient of expansion of the combined strut and skirt structure is approximately equal to that of a cast iron piston. As the bore of this engine is 3⅜ in. these pistons are fitted loosely on .002 in. feelers and tight on .003 in. feelers, corresponding closely to the empirical rule for fitting cast iron pistons. Conventional practice had established the rule of .001 in. clearance for each inch of bore when cast iron pistons are used.

The unusual feature of the Chrysler piston is the strut of invar alloy. Pure invar is not used, because of its cost and scarcity, but the alloy used here has but a fraction of the coefficient of expansion of steel and is readily obtainable at commercial prices. In this case the combined structure has a rate of expansion which is considerably less than that of cast iron and these pistons are fitted with clearance of as little as .0015 in. although the diameter of the cylinder is 3½ in.

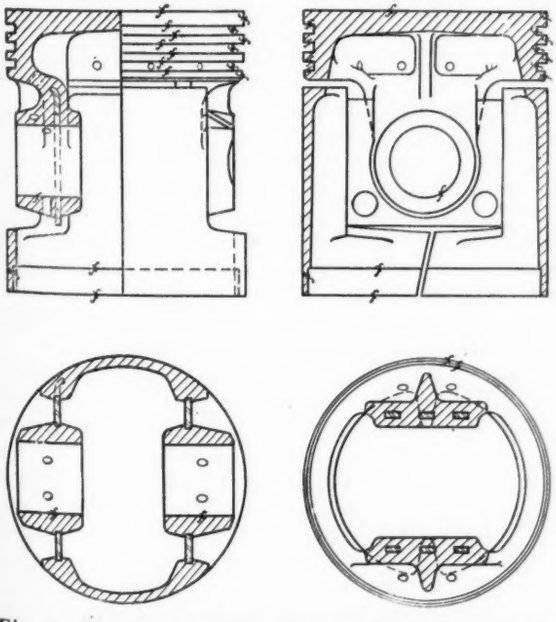


Fig. 2. Chrysler 80 piston having invar strut which makes expansion coefficient of piston less than that of cast iron. Bottom end of skirt is slotted

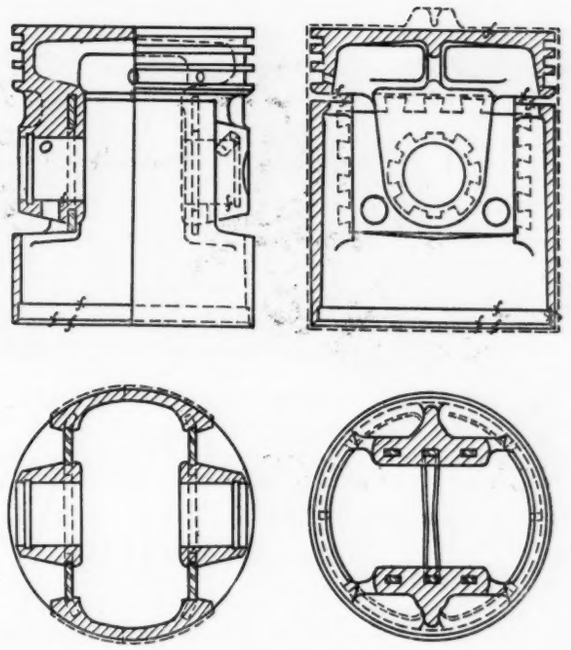


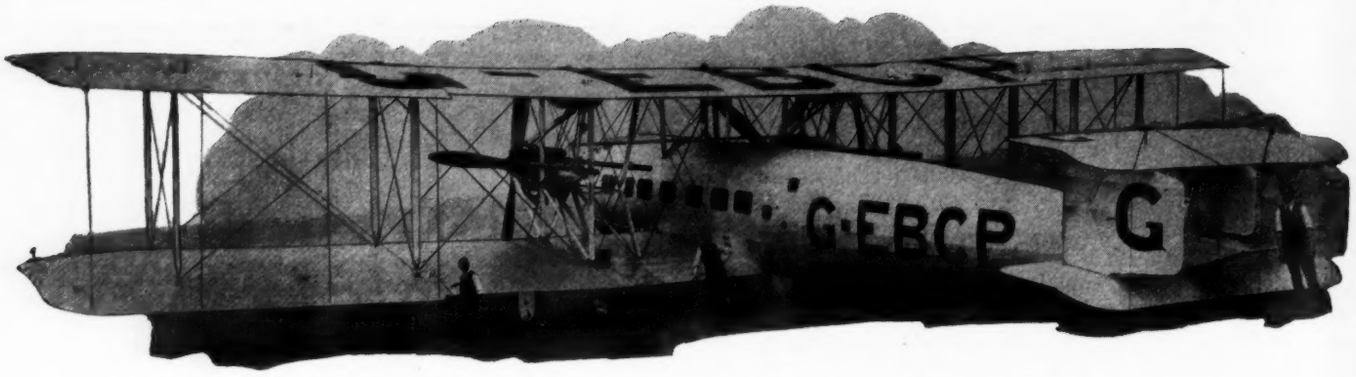
Fig. 3. Bohnalite piston used in Star four engine has hot rolled steel struts. Skirt has ground relief on lower end

Outside of the strut feature, conventional practice is followed in the design. The section in the head portion is heavy and tapers toward the lower edge while the skirt is insulated from the direct heat of the head by the saw slot below the lower ring. The thickness of the skirt section varies from top to bottom but averages around ⅛ in. Struts have a thickness of .078 in. and direction of the fibre of the metal is horizontal when the piston is in place in the engine. In the Chrysler design, the lower end is saw-slotted on both sides in line with the pin ends, while the Star piston has a ground relief of about .020 in. in the same location. According to Bohn engineers, both of these arrangements are satisfactory and it is a matter of individaul choice.

The method of retaining the piston pin is also left to the individual designer but ordinarily the pin oscillates directly in the metal of the piston boss. The illustrations herewith show two typical designs but the strut type of construction is adaptable to practically all of the recognized arrangements of light alloy pistons.

In production these pistons are made entirely by the permanent molding process, consequently no sand cores are used at any point and all of the surfaces are smooth and held to close dimensional limits. A slight chilling action is inherent in the permanent mold process. Before being machined, all castings are double heat-treated by a continuous process which is controlled by pyrometers.

A FINAL decision has been rendered in the patent suit concerning the invention of the "joy stick" as used on all modern airplanes, by the French Court of Cassation, whereby M. Esnault Pelterie is declared the inventor. Soon after the conclusion of hostilities Esnault Pelterie brought suits against a number of French makers of airplanes, claiming infringement and asking for an accounting of damages. The rejoinder of these makers was that they had been ordered by the Minister of War to fit this control apparatus. After the Court of Appeals had recognized the validity of the patent, one of the defendants carried the case to the Court of Cassation from the decisions of which there is no appeal. This court has now sustained the lower courts.



New Vickers "Vanguard" Largest Passenger Carrying Plane in World

By Athel F. Denham

A DIRECT descendant of the famous "City of London" air express and developed from the "Vimys" of transatlantic fame, the Vickers "Vanguard," which is being put into service on the Imperial Airways line between Croydon and Paris, is the largest passenger carrying plane in the world at present. It was built according to the British Air Ministry specifications and has been subject to performance tests by the Air Ministry before being turned over to Imperial Airways. The rapid increase of passenger service by air between Paris and London by this company which, since the inauguration of its express lines two years ago has flown its planes nearly 2,000,000 miles and carried over 20,000 passengers, has made this new development necessary.

Specifications of Vickers' "Vanguard 11"

Length	60 ft. 3 in.
Height	17 ft. 3 in.
Span, main wings	87 ft. 9 in.
Chord, main wings	13 ft. 0 in.
Area, main wings	2128 sq. ft.
Engine make	two Rolls-Royce "Condors"
Total horsepower	1392
Speed full throttle	113 miles per hour
Landing speed	49 miles per hour
Climb	10,000 ft. in 23 mins., 33 secs.
Endurance at cruising speed	4½ hr.
Weight empty	12,462 lb.
Useful load	5598 lb.
Total weight	18.460 lb.
Weight per hp.	13.25 lb.
Weight per sq. ft. of wing surface	8.5 lb.

Equipped with two Rolls-Royce "Condor" engines and having a total weight when fully loaded of over 18,000 lb., the ship has a carrying capacity of 25 passengers including the pilot and navigator. Actual pay-load, available for passengers and freight when gasoline and oil sufficient for a flight of 4½ hours' duration is being carried is 3800 lb., giving a total useful load of nearly 6000 lb.

Although of biplane construction the "Vanguard" has the enormous wing-spread of 87 ft. 9 in., which, with the 13 ft. chord of the wings, gives the plane a total main wing area of 2128 sq. ft. Nevertheless the wing loading is only 8.5 lb. per sq. ft., which is considerably lower than that used in the "Barling Bomber" and the "Remington-Burnelli," the only two planes built in this country in recent years comparable in passenger carrying capacity to the "Vanguard."

To eliminate difficulty in storing this huge plane, the wings have been constructed so that they can be folded back, the width with the wings folded being slightly over 44 ft. The over-all length of the plane is 60 ft. 3 in. and the height 17 ft. 3 in.

Oleo-pneumatic shock absorbers have been fitted to the under carriage to insure smooth landings, the landing speed of the machine being approximately 50 miles an hour. Its two Rolls-Royce engines, which develop a total of nearly 1400 hp. gives the plane a maximum speed of 113 miles an hour and a climb to 10,000 ft. in 23 minutes and 33 seconds. A reduction gear with a ratio of .477 has been fitted to the engines, reducing the normal crankshaft speed of 1900 r.p.m. to a normal propeller shaft speed of 907 r.p.m. This has enabled the Vickers Company to fit large high efficiency propellers to the "Vanguard."

Many ingenious instruments are fitted in the cockpit including a Reid control-indicator, an apparatus which provides the pilot and navigator with an immediate indication of any departure from the set course, and, in conjunction with the compass, assists greatly in the maintenance of an accurate course, both when the machine is flying in foggy weather, or during night flying for which type of transportation the "Vanguard" has been especially designed.

The passenger cabin is fitted with separate arm chair seats following the standard practice of passenger aircraft design. The cabin is electrically heated and ventilated. There are holders for baggage, lockers for mail or parcels and lavatory accommodations, while a new departure in aircraft equipment, a canteen, has been included for the refreshment of passengers during flight. Access to the cockpit in the nose of the machine, in which the crew, pilot and navigator are located, is through a door at the front of the passenger compartment. A wireless telephone installation forms part of the equipment and there are special emergency hatches.

Just Among Ourselves

The Industry Gets Attention From Bankers

BANKERS from time to time continue to take pot shots at the automotive industry, sometimes hitting the mark squarely and other times not coming so close. Generally speaking the automobile business stands well with the banks today and bankers generally have a far better understanding of its possibilities and fundamental soundness than they had five years ago. O. H. Cheney, vice-president, American Exchange & Pacific National Bank, in several speeches recently has been commenting on various phases of automotive marketing and has been stressing especially the possibilities of danger in too great an extension of installment buying, particularly should a business recession set in. He also speaks of the practice of turning in old cars in part payment for new ones as "the trade-in craze." With part of Mr. Cheney's estimate of the automotive situation we agree, for he says "there is no doubt that the automotive industry is, in important respects, on an established basis. The automobile appeals to many fundamental needs of our people and a substantial demand for it will continue long after the actual number of cars in operation reaches a maximum. And it is to the credit of executives of the industry that they have learned their bitter lessons and have tried generally to keep production closely in line with demand."

* * *

Economic Devil'll Get You, If You Don't Watch Out

BUT, while Mr. Cheney's warnings about the dangers of too liberal installment terms are entirely in order just now, he verges very closely on calamity howling with so strong a statement as: "The truth is that too many families are signing on the dotted line—and signing away their souls to the economic devil." That there is an economic devil probably must be admitted by everyone who has to pay bills the first of every month, but we are forced to maintain stoutly that automobile installment selling isn't nearly so closely allied with that evil spirit as are some other phases of our body politic.

* * *

General Reading Helps Business Understanding

INCOMPLETE knowledge of mental attitudes and customs of people in foreign lands is, of course, one of the important barriers to maximum effectiveness in export selling and sales promotion work. If we understood the emotional and mental processes of our overseas customers as well as we do those of our domestic prospects our export work could be made more efficient as well as more effective. The thought occurs that business men don't always recognize that fiction and general literature may provide a far better insight into the minds and emotions of a foreign race than ever could be obtained from trade reports and business bulletins.

* * *

Automobile Plays Strong Part in Mexican Life

WE'RE reminded of this fact by being in the midst of D. H. Lawrence's "The Plumed Serpent" which is more intriguing as a study of the soul of a people—the Mexicans in this case—than as fiction in the ordinary sense. Speaking of "the passive negation of the Indian," Lawrence says "He understands soul, which is of the blood. But spirit, which is superior, is the quality of our civilization, this, in the mass, he darkly repudiates . . . But," Lawrence adds, "perhaps the automobile will make roads even through the inaccessible soul of the Indian."

Will We Have Bigger Airships Soon?

HEAVIER-THAN-AIR experts and enthusiasts still believe in the future of very large ships of the heavier-than-air type. One expert told us the other day that he has no doubt whatever but that we will have successful and safe airships of 10,000,000 cu. ft. capacity within a few years. He does not believe that size in itself is any hindrance to safety.

* * *

Railroad Passenger Traffic "Ain't Goin' to Decline No Mo' "

WHATEVER losses the railroads may have sustained in passenger traffic due to increased use of automobiles seems to have reached bottom, acording to a survey made by A. B. Barber, manager, department of transportation, U. S. Chamber of Commerce. "There was a marked decline in railroad passenger traffic," Mr. Barber said recently, "from 1920 to 1924, but the figures for 1925 were only a fraction of one per cent under those for 1924." Past losses have been almost entirely in short haul traffic, as would be expected.

* * *

Used Car Figures Difficult to Get

THIS year the used car is going to be made a regular member of the automobile sales family. Like the prodigal son, it has returned, but unlike that Biblical character it is not being received with open arms. Nevertheless, most manufacturers and dealers have given up the idea of disowning it. Instead they're trying to reform it and make it a respectable member of the community. To do this adequately, a great deal more accurate statistics about used cars stocks, sales, etc., will be needed.—N. G. S.

Pressed Metal Progress

1. *Hand Operations Cut to Minimum*
2. *Swaging and Coining Extended*
3. *Hot Sizing Methods Improved*
4. *Continued Trend Toward Heavier Presses*
5. *Multiple Operation Equipment Developed*

By E. V. Crane, M. E.
Staff Engineer, E. W. Bliss Company

Fig. 2. Steel press forgings, large and small

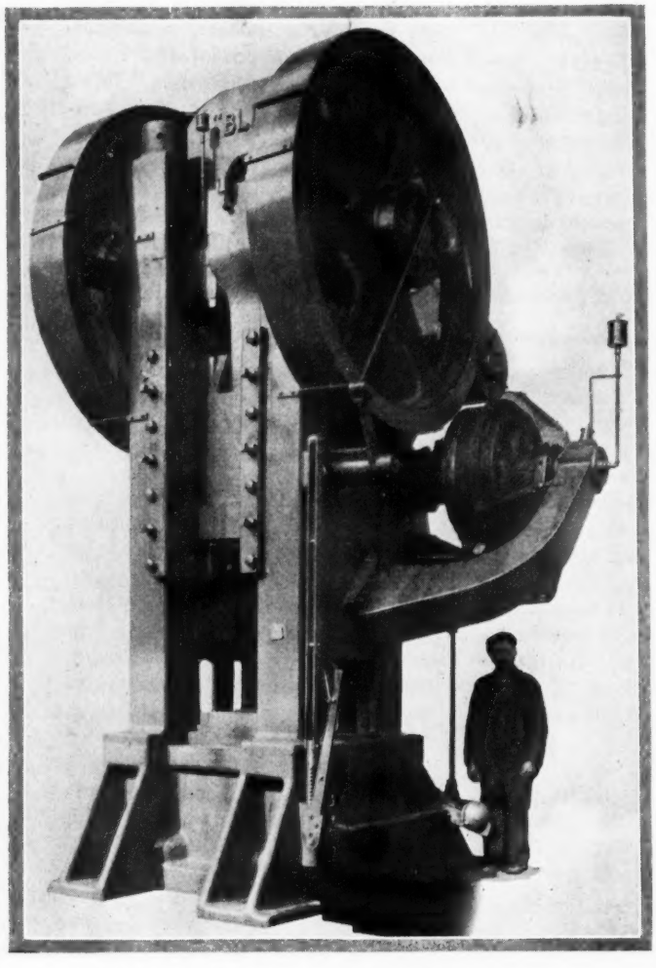


Fig. 1. A Bliss No. 48 forging press

THAT most of the sensational developments affecting pressed metal production in the automotive field have been made is possibly true. We can not tell. But progress continues, to a more or less marked degree, in the application of the well known principles and in the development of newer phases of the art.

The savings incidental to the substitution of press operations for hand or machining operations are classic. Few operations indeed are as cheap as those performed on presses. Dollar for dollar, as much of the metal going into this year's cars has been press worked as has been machined. And the proportion still increases; witness the rise of the all-steel body.

It is worthy of note that for some time past there has been considerable attention devoted to swaging or coining operations in finishing such parts as the bosses of forged levers, connecting rods, etc. The presses used are usually of the knuckle joint type, fitted in some cases with mechanical feeds. A mechanical press of ample capacity and with properly shrunk steel tie rods comes to the same place every time. Despite variations then, in the material and between forging limits, the resulting variations in the sized forgings are within those limits regularly allowed in milling interchangeable parts. Microscopic investigations show no appreciable effect upon the metal due to the squeeze. In the matter of cost the press sizing has demonstrated a clear and very considerable saving over the milling.

More recent is the tendency toward the development of press forging and of hot sizing methods for automobile parts in copper, brass and steel. Frequent economy in time is accompanied by a close regulation of finished size with reduced finish allowance and flash scrap. Close control of automatic furnace and brief exposure to oxidation, which go with this process, result in a very clean surface finish. There are of course, certain limitations to this method of forging, or of sizing forgings or castings, based chiefly on shape. Figures 1 and 2 show a

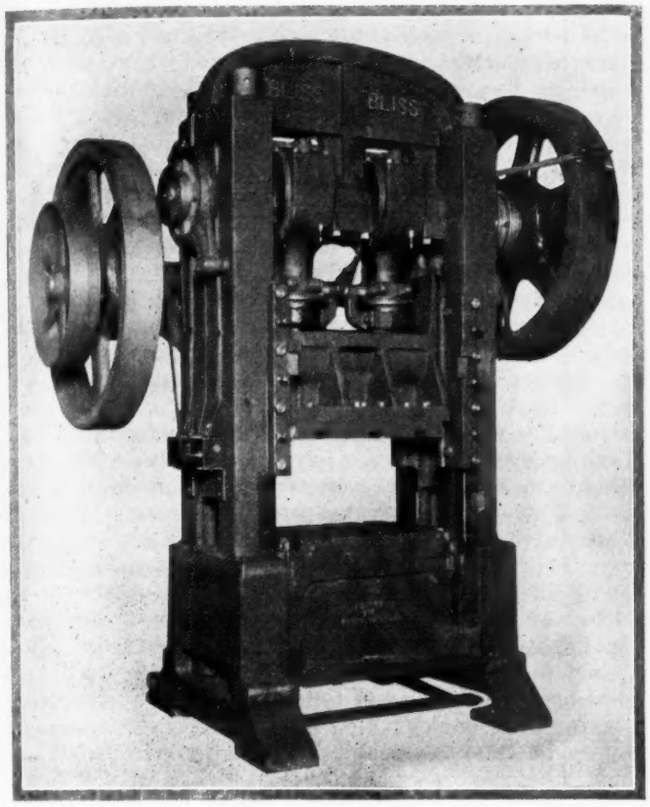


Fig. 3. A forging press for several operations

twenty pound steel press forging for a well known car and the press used to produce it. One stroke fashions the billet to the finished piece. Figure 3 shows the double eccentric type of forging press for a series of operations. Rigidity, compactness and speed are essential characteristics of all these forging presses. Side shears for trimming or forming are often provided too.

The tendency toward larger and heavier equipment still continues despite some trend toward smaller models in cars. Its cause is rather an increasing use of presses on the heavier gages and for parts of considerable mass. A press for drawing up the largest and heaviest rear axle housings is shown in figure 4. This is a Bliss No. 1018 Toggle Drawing Press of rather unusual design. All of the toggle linkage which produces the holding dwell, is below the bed line. The crankshaft of the machine measures eighteen inches in diameter at the main bearings and twenty-one inches at the crankpin. Note the man beside it. The size to which mechanical presses can go has apparently not been reached as yet, for tentative plans already exist for machines larger than any so far.

The desire has manifested itself to combine automatically, large presses for the production of such parts as are required in sufficient quantity to keep an equipment going the year around. A worthy model in miniature is found in automatic can making equipments like that shown in Fig. 5. Here the blank is carried by automatic conveyors through the several machines, and delivered as a finished can in the freight car or storage. And yet the entire equipment is adjustable for different sizes.

The applications of this conception in the automotive field are still few and little can be said of them as yet. The promise is tempting—advanced speed, reduced labor, reduced storage space, reduced work in process inventory. However, it takes careful planning, time and money to get such an equipment in order. The product must be of a shape easy to handle, the presses must be synchronized or stepped a little ahead and tools must be duplicated and changed periodically during shut down time.

Along this same line, but for smaller work, presses have been built, for many years, adapted to performing four, five, six operations in series and without intermediate handling of the part. Only lately, however, have these aroused interest in the automotive industry and developed into the larger sizes. So far as type is concerned these are stiff double crank presses arranged with individual adjustment for the dies for each operation. They are equipped with an introductory feed of either the roll or friction dial type and with a transfer feed to handle the work between operations. The dies are built in individual holders which may be removed without disturbing other dies. Double action presses have been used in some cases but it is usually more satisfactory to use the single action type with suitable drawing attachments where required.

There are of course limitations to the use of these presses. A large production on pretty well standardized parts is a prerequisite. The shape of the part at the several stages should lend itself fairly well to the method of feeding. The operations to be combined must not be such as to harden the metal unduly, with consequent breakage loss. Tolerances should not be so close as to necessitate frequent die dressing. Every time it becomes necessary to adjust one die the whole series are shut down, though this makes little difference to upkeep costs.

These limitations are liable to be disregarded when it is considered that one press with one operator and probably one helper replaces five or six presses with as many

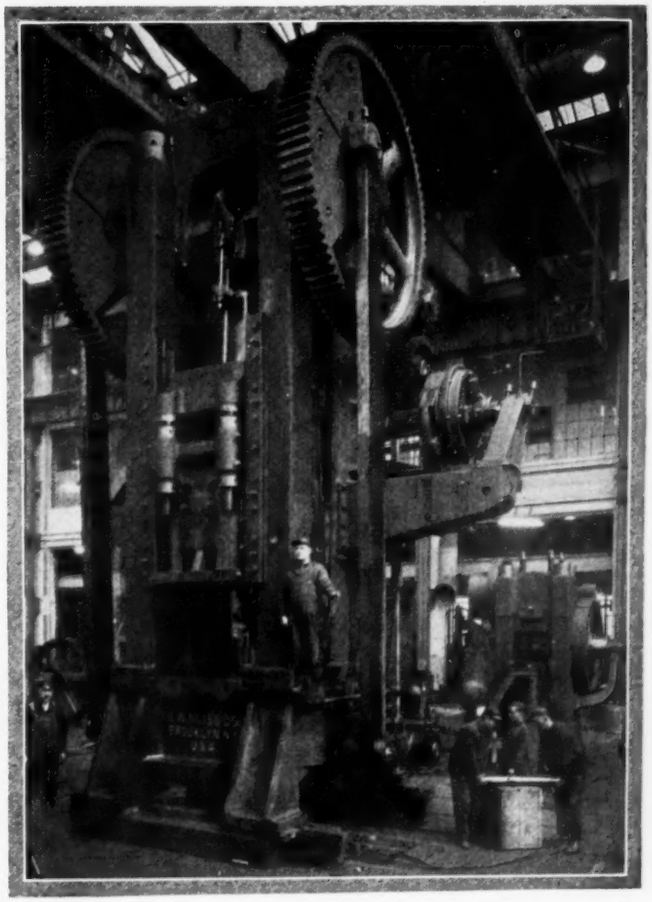
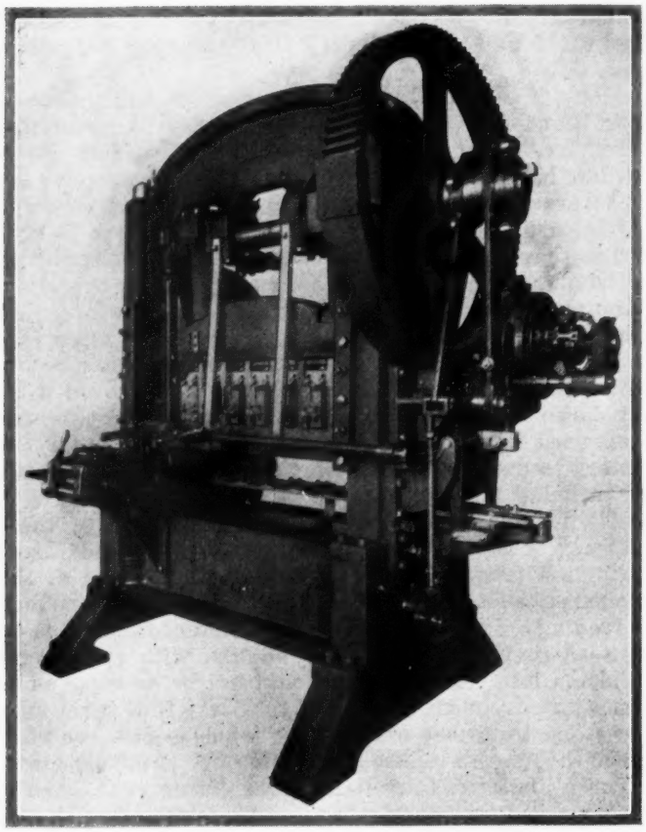


Fig. 4. A press for drawing heavy truck axle housings, cold



operators and several helpers to move the work. In the same way such an equipment reduces the amount of material in process (between operations) and the storage space required for it.

Figure 6 shows a press of multiple operation type and in figure 7 are collected several typical series of operations. The parts marked with an asterisk (*) were previously cut and formed in a double action press and then fed in by means of a friction dial feed. Where blanks are shown the stock was fed in strip form. Note the variety of operations illustrated. These include blanking, drawing, reducing, sizing, trimming, stamping, perforating, burring and curling. In the first series, after five operations, the part was annealed and fed in for five more operations.

It used to be that whenever a new press was needed it was ordered to suit the job immediately in view and without any particular reference to existing press equipment. There resulted many press equipments including an unrelated collection of sizes and varieties, usually no two alike. And whenever a press broke down or was tied up on a large run, all other dies fitting that press had to wait for it though other presses stood idle.

In effect this condition still holds in many plants. Against it, however, is an increasing tendency to standardize on a few sizes and types of presses each capable of taking in a considerable range of work. Dies then are built to be interchangeable for a large number of ma-

Fig. 6 (LEFT). *A press which performs up to seven consecutive operations*

Fig. 5 (BELOW). *Part of an automatic can line*

chines, and the possibility of local congestion or of embarrassment in case of accident is practically eliminated.

Figure 8 shows a press very popular for body work. Sixty odd presses identical with this were recently completed in a single lot for one automobile manufacture. Even the bolster drilling and tapping was standardized for this entire group.

In line with the standardization of sizes and also the "vertical combination" principle previously mentioned, some manufacturers, especially of bodies, are so arranging their plants that their large presses can be lifted bodily and rearranged to suit a new series of operations.

A report of progress on metal working is incomplete without mention of the study being devoted to the metal itself, and the results thereof. In drawing operations a metal having too fine a grain size or non uniform grain size will harden excessively around the edge under severe cold working with cracks and tears resulting. Granted proper tools and set up, the quality of the metal can make the difference of one operation or even two in the production of a deep drawn part, such for instance as a crankcase. And operations are money on such quantities as this industry knows.

If composition, rolling and annealing are not carefully controlled, the structure of the metal cannot be uniform. And the scrap pile must grow for the manufacturer who cuts operations to the bone.

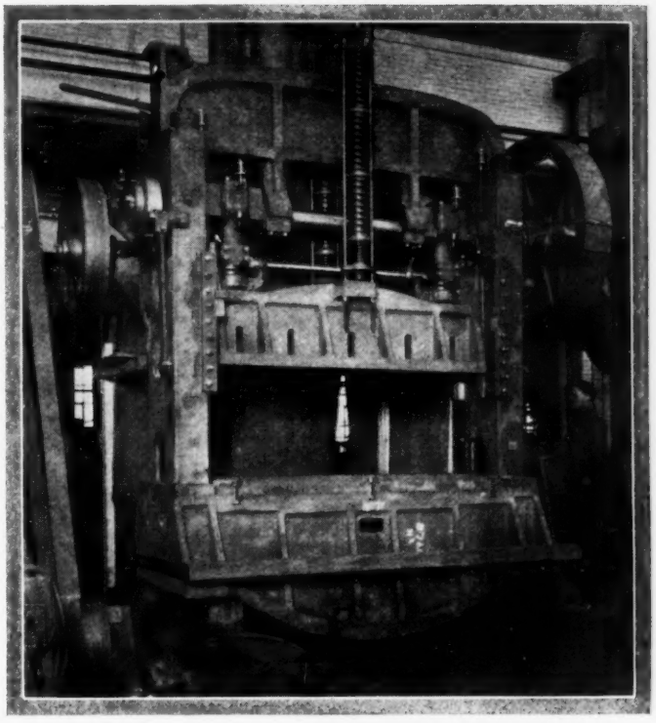


Fig. 8. One of a group of sixty-odd identical presses, part of a standardized equipment

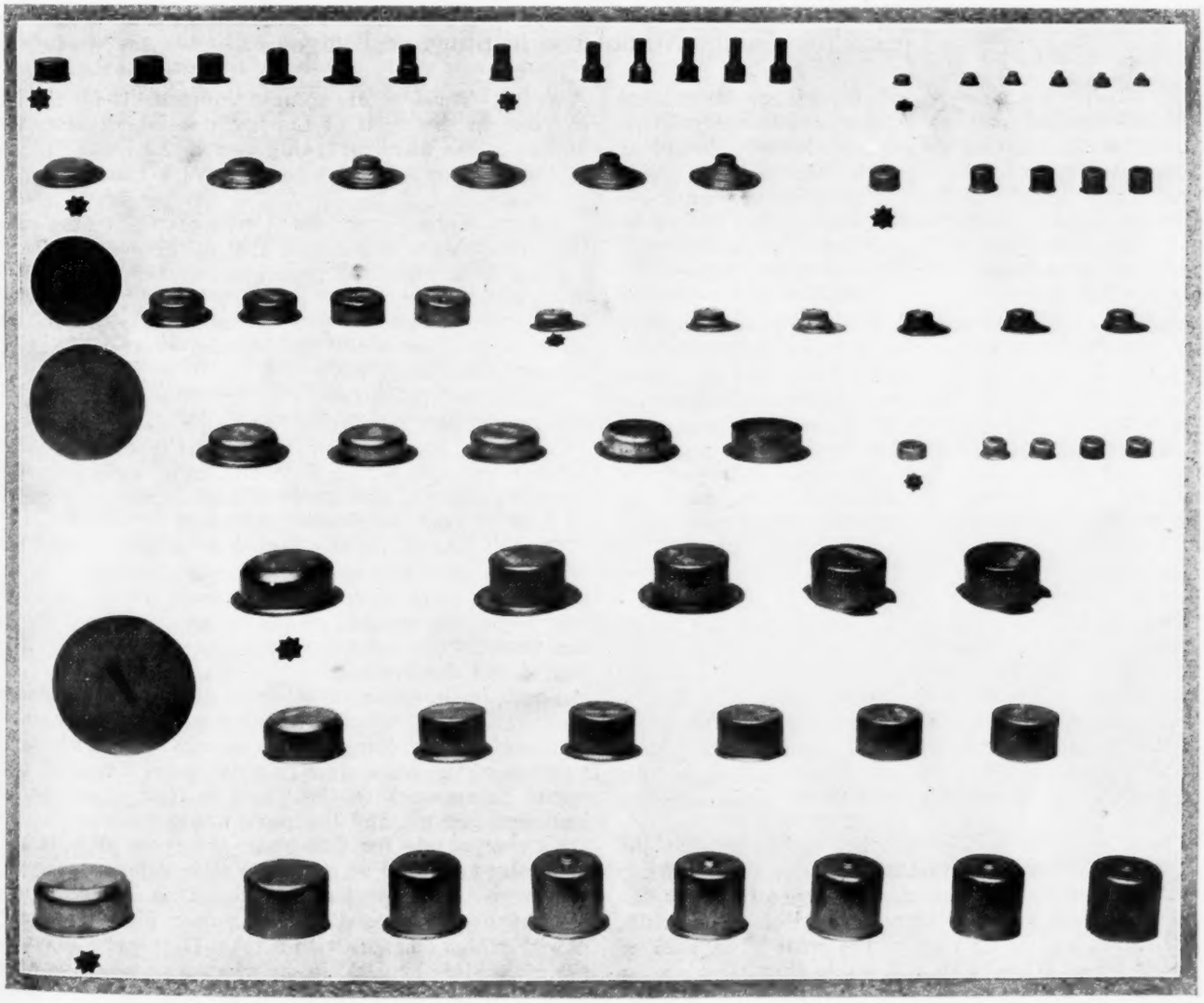


Fig. 7. Groups of parts produced at one handling in Bliss Multiple Operation Presses

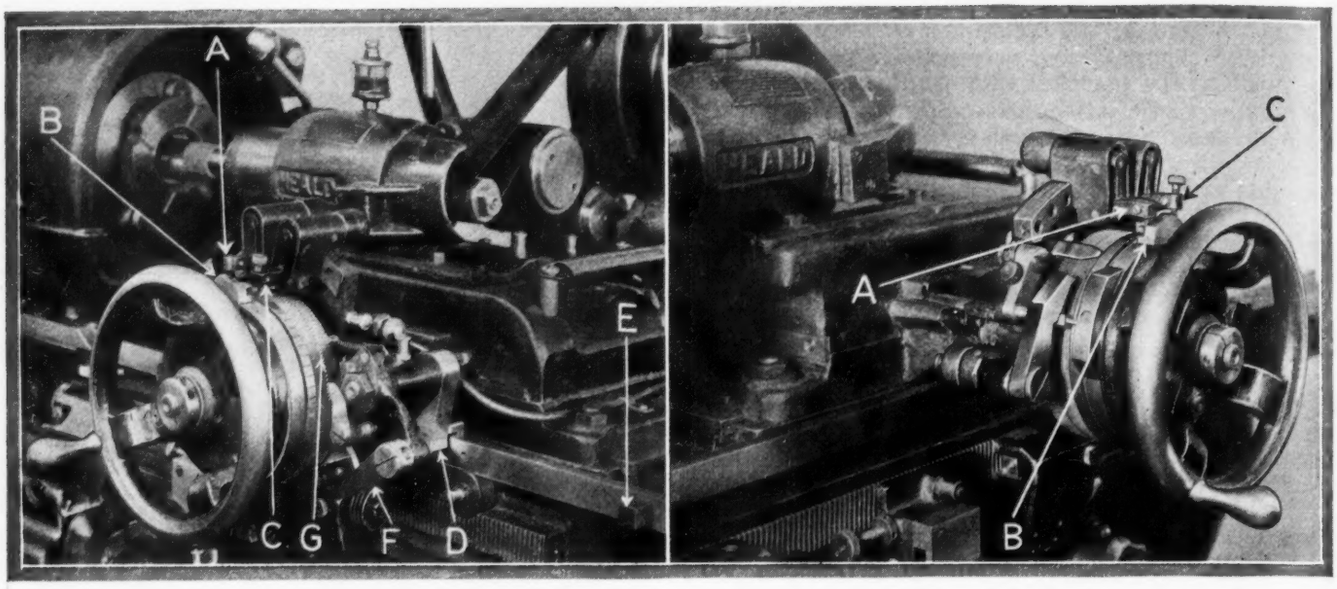


Fig. 1. Right hand view of cross slide of new Heald Size-Matic automatic internal grinding machine

Fig. 2. Left hand view of cross slide, showing pawls and arrangement for automatically securing roughing and finishing feed

Internal Grinder "Sizes" Automatically

"Size-Matic" is name of new machine introduced by Heald for sizing without use of plugs and gages.

THE Heald Machine Co. of Worcester, Mass., has placed on the market a new automatic internal grinding machine known as the Size-Matic. Except as regards loading and unloading, the machine is entirely automatic; it "sizes" without the use of plugs and gages and it is claimed by the manufacturer that it can be used on small, tapered and blind holes, and holes with keyways, with the same advantage as on ordinary sized, straight, plain holes.

The cycle of operations, which is performed automatically, is as follows: After the operator has loaded the chuck, he throws over the reverse lever and the wheel moves up to the work at full speed; it then automatically slows down to the roughing speed and roughing feed, and continues to grind until the hole has very nearly reached the finish size. Then the head automatically withdraws from the work, the diamond drops into place and the wheel is automatically trued at the proper speed, after which it starts grinding again, the speed and feed having been changed automatically to the proper values for finish grinding.

When the hole has reached the finish size, the wheel automatically withdraws from the work and all parts of the machine assume their position of rest. The operator then removes the work and the cycle of operation is completed. All of the automatic features of this machine, with the exception of the sizing arrangement, are identical with those of the Full Automatic and were fully described in the Sept. 3, 1925, issue of *Automotive Industries.*

In the Size-Matic the sizing indicator box used on the Full Automatic has been eliminated, and an entirely new method of sizing adopted, with control by the diamond and cross slide. Referring to Fig. 1 herewith, which shows a close-up view of the cross slide, back of the hand wheel there is an adjustable ring carrying the cam B, over which ride the cam followers or "points" A and C. These points actuate the contacts for the magnet box on the front of the machine which control the motion of the diamond truing device and bring the parts to the position of rest when the work has reached the finish size.

Point G riding over cam B controls the truing operation, while point C controls the finishing operation. A ratchet G is anchored through reduction gears to the cross slide screw, and is operated by the pawl F, which in turn is operated by pawl D riding over pin E as the main table approaches the position of rest. Sizing is accomplished as follows:

Having set the diamond to true the wheel at a predetermined size relative to the finish size of the hole, it becomes a simple matter to advance the cross slide a definite amount—which is controlled by the distance between contacts A and B—to grind exactly the same size of hole in each successive piece.

On the Size-Matic the cam B is a part of the hand wheel and assumes exactly the same position for each successive piece, for truing as well as for finishing. Therefore, the number of passes of the wheel through the work is the same for each piece, which results in continuous duplication.

There is, however, another factor to be considered, and that is the reduction in diameter of the wheel due to grinding and truing. If no change were made in the position of the cross slide relative to the diamond, there would be no stock on the wheel to trim after one hole has been ground, and the work would not come to size.

To compensate for this wear, the cross slide is automatically advanced as the cross slide comes to the position of rest at the end of a cycle. This is accomplished by means of the pawl D riding over pin E, operating pawl F which engages with ratchet G, thereby advancing the cross slide by 0.001 in. or whatever amount is necessary to compensate for wheel wear.

New Yellow Ton Truck is Powered With Knight-Type Engine

"Money Maker" truck will be marketed through separate organization. Has aluminum crankcase, force feed lubrication and air cleaner.

By Leslie S. Gillette

POWERED with a sleeve valve engine specially developed for work in fast delivery service, the Yellow Truck & Coach Mfg. Co. has announced an entirely new one-ton truck chassis listing at $1095 f.o.b., Chicago. The truck will be known as the Yellow-Knight "Money-Maker" and will be marketed through a separate Yellow sales organization in addition to being handled by the regular G.M.C. branches and dealers. Changes in the factory have been completed which will enable a minimum of 1000 of the new Yellow-Knight trucks to be produced a month.

The chassis is of exceptionally rugged construction throughout, the main thought in the development of the new truck being to build a vehicle that would not have to be withdrawn from service for minor maintenance work and repairs. With the adoption of a Knight type engine, delays for valve grinding and carbon removal are eliminated while higher fuel economy and longer life are claimed.

185 Cu. In. Piston Displacement

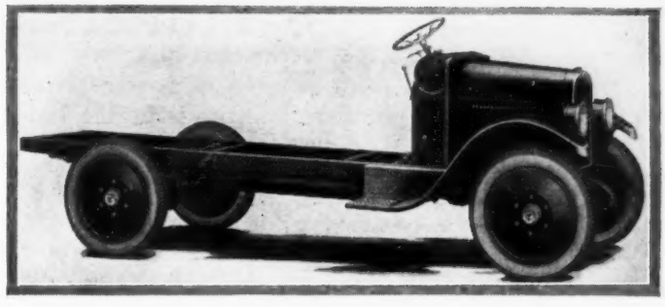
Mounted in three point suspension, the four-cylinder powerplant with its 3 7/16 in. bore by 5 in. stroke has a piston displacement of 185 cu. in. and develops 41 b.hp. at 2100 r.p.m. The cylinder block, with removable head, is bolted to the aluminum crankcase, the bottom flange of the latter, to which is secured the pressed steel oil pan, being carried several inches below the center line of the crankshaft to provide additional stiffness. Three bronze back, babbitt lined bearings carry the crankshaft. The dimensions are:

Front, 2 5/32 in. diameter by 2 7/15 in. long
Center, 2 7/32 in. diameter by 2 1/16 in. long
Rear, 2 9/32 in. diameter by 3 5/16 in. long

Pistons of annealed and ground cast iron and 4 in. long are fitted with three rings 3/16 in. wide. Force feed lubrication system is employed with the gear driven oil pump operated from the eccentric shaft.

The four bladed fan mounted on the front of the cylinder block and provided with an eccentric form of adjustment is driven from the crankshaft by a "vee" belt. Water is circulated through the cooling system by thermo-syphon, the capacity of the cellular radiator and the water jackets being 5 gallons. Fuel is fed to the carburetor by gravity from the 11 gallon cylindrical tank mounted on the driver's side of the dash.

After passing through an A-C make air cleaner, mounted above the engine, the air for the carburetor passes through a hot-spot formed integral with the exhaust manifold. Ignition is by battery system with the distributor driven off the generator shaft, while the starter carried on the right side of the housing engages with the flywheel through Bendix drive.

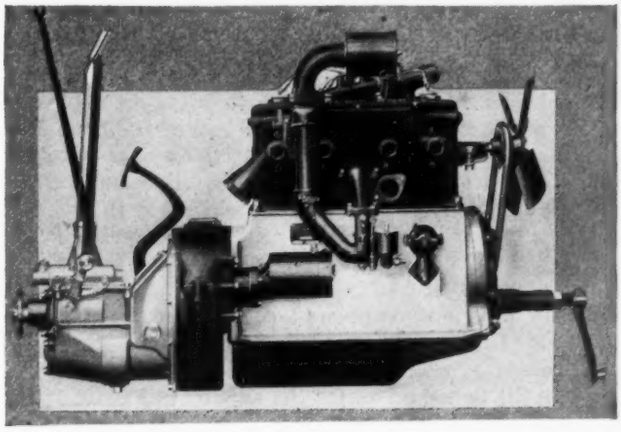


The new Yellow-Knight "Money-Maker" listing at $1095. The straight line frame and the gravity gasoline tank can be seen clearly

Completely enclosed in the cast iron bell housing to which the transmission is bolted forming a unit powerplant, the single plate Borg & Beck clutch is secured to the flywheel. The gearset of the selective sliding type transmission provides three forward and one reverse gear ratios as follows:

Low	4 to 1	Third	1 to 1
Second	2 to 1	Reverse	5.33 to 1

Power is transmitted to the rear axle through metal universal joints and a tubular propeller shaft. Of Timken manufacture, the spiral bevel rear axle provides a standard ratio of 6 1/7 to 1. The housing is of pressed



Right side of the powerplant showing the method of attaching the air cleaner and the general layout of the engine and transmission

steel with the pinion shaft and differential carried on heavy roller bearings. Axle shafts are of special alloy steel and of the semi-floating type. Service brakes operate on the outside with the hand brake operating on the inside of the 15½ in. by 2½ in. drums.

The front axle is an "I" beam section. Front tread is 56 in. the same as the rear. Steering is by Gemmer worm and sector unit. Springs are semi-elliptics all around, the dimensions front and rear being 38 in. long by 2½ in. wide and 50 in. long by 2½ in. wide respectively.

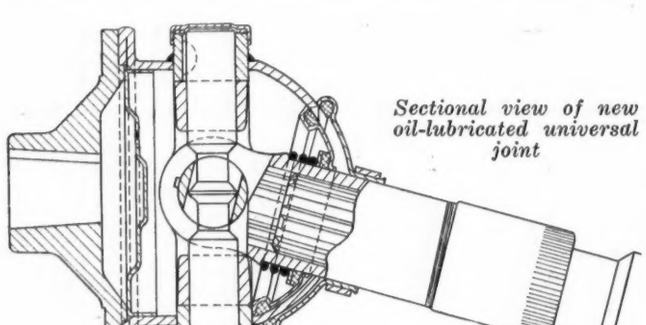
The frame is formed of pressed steel channels 5½ in. deep of 3/16 in. stock running straight from front to rear with no kick-up over the rear axle. Four cross members are provided.

Steel disk wheels carrying 32 by 4½ in. non-skid truck cord tires are provided all round as standard equipment. The wheelbase is standard at 124 in. In addition to the usual supply of equipment, front fenders and steps, electric headlights and tail light and electric horn are provided at no additional cost. Chassis lubrication is by the Alemite system.

New Universal Joint Uses Standard Transmission Oils

A NUMBER of novel features are incorporated in the latest design of universal joint made by the Universal Machine Co. of Bowling Green, Ohio. Due to improvements in construction which insure oil tightness, standard transmission oils instead of the usual 600-W are used to lubricate the new type of joint. As a result, the maker states that the oil film separates the working parts of the joint and therefore prevents abrasion or wear for periods which are from three to five times as long as those identified with the former lubricant. Further improvement has been made by the substitution of a simple ring of molybdenum steel for the former split ring and hardened steel bushings.

As illustrated by Fig. 1, this joint is basically the cross pin and ring type of cardan joint. A pressed steel



Sectional view of new oil-lubricated universal joint

housing with spherical rear end carries the welded-in end bearings for one of the cross pins. The pin which is at right angles with the first pin is mounted in the yoke which forms part of the slip joint or end of the propeller shaft. Each of these pins is secured against rotation around its own axis by Woodruff keys. Freedom at the cross joint between the pins, both of which are full length, is obtained by drilling a cross hole in one and turning clearance grooves on the other as shown.

Oil tightness is secured in four different ways. Screwed caps which bear on compressed cork gaskets are placed at the ends of the pin mounted in the housing. A pressed steel cover is pressed into the end of the joint which mounts on the flange on either the axle or tail shaft of the gear box. Both the inner and outer surfaces of the spherical portion of the housing are finished from the center of rotation of the joint. Spherically ground cork packing rings which are mounted in pressed steel carriers bear on these machine surfaces and the inner carrier is spring actuated with another packing ring on the shank of the splined member. Finally a stamped dust cap which is screwed over the rear end of the splined member also encloses a spring and packing washer combination.

In this manner, the pin ends and the flange end of the joint are sealed postively. The combination of finished surfaces and spherically ground cork washers form a ball and socket joint at the point where the greatest oscillation occurs and the spring actuated cork washers on the yoke member close these outlets and allow ample lubrication for the slip joint.

Metallurgical research is responsible for the elimination of the two-piece ring and usual hardened bushings. In the new construction, the pins have bearing directly in the metal of the ring. The new construction is explained as follows by the manufacturer: "For a number of years we made a joint with a split ring. Then we put hardened and ground bushings in the split ring to increase the life of the bearings of the joint. In the development of the new joint, we discovered that molybdenum steel showing 55-60 scleroscopic hardness after the hardening process could be machined and in this condition would outwear the pins of 3½ per cent nickel steel at 75-80 scleroscopic hardness. We have found this combination of molybdenum and 3½ per cent nickel alloys to be ideal for universal joint bearings.

"In the table of scleroscopic hardness with that of diamond taken as 10, tungsten is 9.7 and molybdenum is 9.5. It seems that the wear resisting properties of molybdenum are due to this hardness of the molecule or the carbide of molybdenum steel."

A PAPER on the oil shale deposits of Esthonia was presented at the annual meeting of the Society of German Chemists by A. Sander. According to a recent survey, these deposits cover an area of about 1200 square miles and contain nearly six billion tons of bituminous shales. The average content being 20 per cent, it would be possible to extract more than a billion tons of oil from the shales. The exploitation of these deposits was started only after the War. The quantity of shale annually increased from 10,000 tons in 1919 to 230,000 tons in 1924. The exploitation is practically always carried out in the open air. At the present time the shale is chiefly used directly as fuel, Esthonia being entirely devoid of coal deposits. It is even used as fuel on locomotives, its lower calorific value being 4500 to 5500 B. T. U. per pound.

Specifications Drawn Up for Standard Test of Ignition Apparatus

Automotive Electric Association recommends use of calibrated adjustable spark gap in making bench tests. Data entry sheet.

SPECIFICATIONS for a standard test of ignition apparatus have been drawn up by the Automotive Electric Association, which has its headquarters in Cleveland.

Use is made of a calibrated, adjustable spark gap, across which one or more sparks from the distributor must pass without miss for 10 seconds, at each of the speeds specified. A test sheet (Fig. 1) has been prepared on which the data of the test is to be entered, and this is to show the maximum width of gap across which the apparatus under test will continue regularly without miss for 10 seconds. Primary voltage and current are also recorded for each speed, to provide the necessary data for plotting comparative curves of spark length, current draw and battery voltage against engine speed. The connections for the ammeter A and voltmeter V are shown in Fig. 3.

The different voltages—4, 6 and 8 volts—are intended to approximate the various conditions encountered in practice. The 4-volt test corresponds to starting conditions, the battery voltage being then reduced by the starting motor current draw. It is usually sufficient to extend the 4-volt test over the first five speeds (50-400 r.p.m.). The 6-volt test corresponds to a normally charged battery, the voltage of which is active in the ignition circuit at car speeds below that at which the generator begins to charge. The 8-volt test corresponds to the condition when the generator is charging a full battery.

These voltages are obtained by using two, three and four cells of a lead acid battery in a normal state of charge, the voltage being measured as shown in Fig. 3. The coil primary current is measured by a d.c. ammeter, connected as shown in Fig. 3. The test is carried out by discharging the sparks from only one high tension distributor terminal across the calibrated gap, the sparks from the remaining terminals of the distributor being allowed to discharge across separate auxiliary gaps with points set 3/16 in. apart.

The test should be carried out under the following conditions:

1. Spark length to be measured on the standard calibrated spark gap as per A. E. A. specifications.
2. The spark length to be recorded on the test sheet to be the maximum distance the coil will fire across the standard A. E. A. gap for 10 seconds without miss, at the speeds and voltages specified.
3. Renew the needle points on the calibrated gap for each coil test.
4. Coil to be at room temperature (approximately 75° F.) at the start of the test.
5. Primary voltage to be taken at primary coil terminals with breaker contact in series.
6. The contact opening to be the same as used in production and specified as noted on the test sheet.
7. Two, three or four cells of a lead-acid battery in a normal state of charge may be considered close enough for obtaining the required voltages.
8. The high tension or insulated end of the spark coil secondary should be negative.
9. For 12-volt systems use 8, 12 and 16 volts in place of 4, 6 and 8.
10. The calibrated spark gap must be protected from air currents.

IGNITION PERFORMANCE TEST SHEET

Fig. 1

Date		Type		No. Cyls.		Mfgr.			Contact Opening		
	4 Volts			6 Volts			8 Volts				
Eng. R.P.M.	Prim. Amps.	Spark Length	Volts across Coil Pri: at Zero Speed	Prim. Amps.	Spark Length	Volts across Coil Pri: at Zero Speed	Prim. Amps.	Spark Length	Volts across Coil Pri: at Zero Speed		
0											
50											
100											
150											
200											
400											
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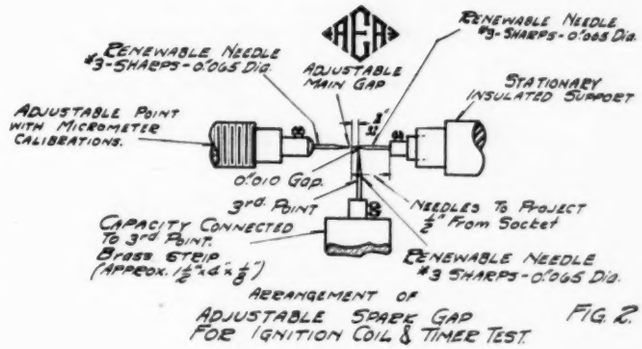


Arrangement of Adjustable Spare Gap for Ignition Coil & Timer Test. Fig. 2.

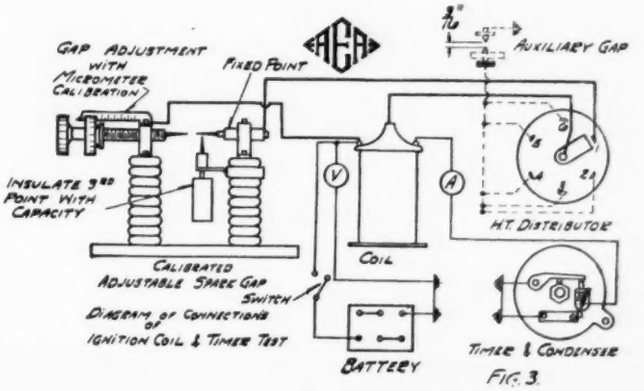


Fig. 3.

THE FORUM

Proper Rolling Prevents Road Corrugations

Editor AUTOMOTIVE INDUSTRIES:

Your article in the Feb. 4 issue, page 195, "Cause of Road Corrugation," has been read and studied with a great deal of interest by the undersigned, the writer having been for many years much interested in roads, their construction, maintenance and action in the various States.

You are quite corect in that a tar-macadam road will expand and creep, especially in warm weather, due to its plastic condition, the heavy loaded wheels passing over it having the rolling effect and carrying the material ahead of it, thus causing the wavy or washboard condition so often noted. This effect can be minimized in just such measure as a good quantity and quality of crushed rock or stone is added to the mix, using barely enough tar or asphalt to properly fill the voids and act as a binder, this of course in the case of a laid asphalt top road.

Tar-Macadam Make Good Roads

Some of the best roads the writer has seen are tar-macadam roads, properly built, but it is only when the right material is used and when properly packed from the bottom up, with an even pack by a machine that has other than a flat face for packing, that this can be attained.

Regarding the matter of the United States having concrete roads soon, there is approximately 12 per cent of the highways paved at this time, and the real question, it seems to the writer, is how to get the traffic to the concrete highway, 88 per cent of our highways being dirt or gravel.

It is of much importance that the tributary highways be got into usable condition before a policy of concrete roads only is established. Too little attention is paid to the foundation for a concrete highway. Usually the grades are changed as the first step, and only too often the concrete follows without proper packing of the new grade or sufficient time permitted for settling.

On dirt or gravel roads, the "washboard" or wavy condition in its worst form is caused by either an uneven packing at the time new material is put on, or it is packed with a roller of the flat-faced type which unavoidably pushes the material ahead until it meets a slight obstruction and then raises over. Often an attempt is made to offset this by diagonal rolling later; it is plain that this only temporarily corrects the trouble, as with more material at some points than others a more dense structure is created, only to begin breaking down as soon as traffic is let on it. Or, the coarser rocks, or stones, as the road begins to wear present small knobs to the wheels of traffic with the result that a rubber tire bounds free of the road surface as it hits the rock or stone, attains greater speed and when it again hits the roadway starts the depression, which once started grows rapidly.

It is evident, then, that for all gravel and crushed rock roads a roller must be used that does not push the material ahead of it, that packs from the bottom up and by having open spaces alternating with the packing faces has a classifying effect in putting the coarser rocks down toward the bottom. The sooner that either crushed rock or gravel is properly packed the less "fines" there are to wear off, the more flat faces there are in the material, and the longer the material will last. Improper packing is little better than putting on the material and "letting the traffic take it."

It is a fact, borne out by the statistics, that there are more accidents on highways due to fresh rock and gravel than to railroad grade crossings. As stated. the material is worn much more rapidly while it is loose and is thrown out by the traffic and then thrown back by the maintainer.

V. A. VAN HORN, President,
Four-Drive Tractor Co.

Ejector Type Manifolds

Editor AUTOMOTIVE INDUSTRIES:

In the issue of November 19, 1925, page 867, I notice a reference to an ejector effect exhaust manifold (Fig. 7). Such manifolds "have a tendency to draw the remaining spent gases in these cylinders through the nozzles," it is stated.

Several years ago an ejector exhaust manifold was applied to an automobile engine, and while it produced more power in a four-cylinder engine, the increased fuel consumption was such that it had to be abandoned.

JAMES MCINTOSH

Are Engineers Falling Down?

Editor AUTOMOTIVE INDUSTRIES:

Engineers are not falling down and can, if permitted, materially increase thermal efficiency. If manufacturers will not add a dime to the cost of an automobile to increase its fuel mileage 25 per cent, and such is the tendency as long as the public pays for the fuel, engineers have their hands tied. "Why should we change our design and increase our expense if we can sell all we can make and the purchaser pays for the gasoline?" seems to express the matter.

Engineers can increase the miles per unit of fuel from

20 to 25 per cent by adding less weight to a car, but the builders are apparently not interested. Engineers can deliver a dry, cool gas to the combustion chambers, using ordinary commercial fuel, thereby eliminating fuel losses, carbon monoxide in the exhaust and crankcase oil contamination, but builders seem to prefer to recover the fuel after it has done its damage, thereby neutralizing the effect rather than eliminating the cause. It's all right to advise the drivers to throw away one to three gallons of good lubricating oil every 500 miles as long as the purchaser pays the bill.

Heat Loss Unnecessary

The heat lost from a red hot exhaust manifold is unnecessary and a criminal waste. The loss of releasing 40 to 50 lb. absolute pressure at the end of the working stroke can be obviated by converting the pressure into work, but then, muffler manufacturers could not sell mufflers if there were no noise when the exhaust is released. If the exhaust valves were heated no hotter than the admission valves, valve manufacturers could not sell their heat resisting alloy steels. Engine manufacturers are in a rut and evidently manifest no desire to get out.

The Newcomb engine released steam at boiler pressure for 100 years, or until Watt came along with his cut-off and outside condenser and delivered the same power on one-quarter the coal.

Some designers exercise wonderful ingenuity to get one or two per cent more horsepower per unit of piston displacement, which has nothing to do with thermal efficiency, but who ever heard of a manufacturer spending money to get more miles per gallon from his car?

Racing managers limit the piston displacement but permit any engine speed and any supercharger desired by the contestant. If prizes were offered for the best fuel record per ton mile, the racing game would bring about a wonderful conservation of fuel.

Engineers can overcome the losses enumerated and are ready to do so when the manufacturers want more miles per gallon. Engineers are not falling down and the public is not getting that to which it is entitled.

C. E. SARGENT

We wish to call attention in this connection to the editorial on page 235 in our issue of February 11, 1926.—Editor.

Diesel Piston Speeds

Editor AUTOMOTIVE INDUSTRIES:

In the Forum of Dec. 10, there appears a letter from Mr. Robert Matthews, M. S. A. E., which is of interest to the Diesel engineer. If the Canadian National's Diesel engines, which are four-cycle engines of 8.5 in. piston diameter, can run at 1,300 ft. p. m. piston speed, and if even the largest Diesel engines ever put into a motor liner (33 in. cylinder bore) run at 1200 ft. p. m., what difficulty can there be in running a 5-in. two-cycle piston at 1,600 ft. p. m. and 1,600 r.p.m.?

Concerning combustion-chamber processes I wish to refer to an engine which at present holds the fuel consumption record in the medium sized field—the Hesselman four-cycle airless injection engine. The fuel consumption of this engine is as low as 0.37 lb. per b.h.p. hour—a fine figure for a 15 by 20 in. cylinder. The compression pressure is 400 lbs. per sq. in. and ordinarily the maximum pressure is 640 lbs. per sq. in. with a b.m.e.p. of 115 lbs. per sq. in. By varying the timing and the rate of injection of the fuel it is possible to keep the maximum pressure within 20 per cent of the compression pressure, at the cost of a slight increase in the fuel consumption.

The principles which made this engine so economical are simple, and if applied to a two-cycle, would make an engine of exceptional simplicity and of high quality.

Scavenging of a two-cycle engine at high speed is not as serious as many believe, provided certain points are considered. For instance, the loss of scavenging air through the exhaust ports during the scavenging must be and can be stopped. Further, supercharging on the lines followed in certain marine engines, such as the Sulzer two-cycle Diesels, has to be provided for. Luckily, these features can be combined with a third feature which will improve the combustion in the same way as in the Hesselman engine. An engine of this type can run under high m.e.p. at low as well as at high speed, and show the same flexibility as a gasoline engine.

The only question at all serious is the automatic leveling of the pressure during the very short combustion period. A compression pressure of 400-450 lbs. per sq. in. is needed for an easy start without using electric plugs or other heating means, and a rise of say 10 per cent is unavoidable, but 500 lbs. per sq. in. need not be exceeded. To avoid a rise beyond this limit and still have full economical injection it will be necessary to look for something like the "Valley system" or something simpler.

Other details of high speed two-cycle oil engines do not need to make any difficulties in getting them to work satisfactorily up to 1600 r.p.m. Assume, for instance, a four-cylinder two-cycle 4,5 by 5,5 in. engine running at 1200 r.p.m.; it will develop 60 hp. without hesitation.

HUGO MOREN.

Gasoline Economy

Editor AUTOMOTIVE INDUSTRIES:

In an editorial which recently appeared in *Automotive Industries* it was pointed out quite correctly that the public has never shown much interest in gasoline consumption. I know that it is generally believed by automobile manufacturers that gasoline economy is a quality of very little value so far as sales are concerned, but it is a sales argument that has never yet been thoroughly tried out by any large producer. It is my belief that were some large manufacturer to announce and feature the fact that his new model would give 25 per cent better gasoline mileage than the previous models, the public would respond enthusiastically. It would be easy to name a number of cars which could easily be increased to this extent in thermal efficiency.

Nearly all the popular demands in the automobile field have been created by the manufacturers. When a few manufacturers have introduced improvements that have hit the public taste there has been a quick response, a strong demand and other manufacturers have fallen into line, and in gasoline economy the first move will have to come from the factories. There is plenty of cheap gasoline, there undoubtedly will be for many years to come. The gasoline bill is only a small item in the cost of operating a car, but ultimately the number of new cars sold must depend upon their cost of operation, which means that the more the latter is reduced the larger will be the automobile market. Cost of operation can only be reduced by paying attention to everything, saving a little here and a little there, and gasoline economy is far the most spectacular opportunity.

A. LUDLOW CLAYDEN,
Sun Oil Co.

Foreign Airplane Specifications

MAKE AND MODEL	CHARACTERISTICS			GENERAL DIMENSIONS (meters)							ENGINE				PERFORMANCE					WEIGHTS (kilos)			
								Main Wings							Speed (Kilo. Per Hr.)		Climb						
	Class	Type	Designed For	Seating Capacity (Incl. Pilot)	Length	Height	Wings of Folding Type?	Span	Chord	Total Area	Make	Number	Total Horse Power	Type	Full Throttle	Landing	Altitude (M.)	Minutes	Endurance at Cruising Speed (Hrs.)	Fully Loaded	Useful Load	Per H.P.	Per Square Meter of Surface
FRENCH																							
††Bernard B2	Tr-Mo.	Land Mac.	Ra-Ma.	1	6.70	2.30	No.	9.90	.....	11.6	Hispano Suiza.	1	550	W....	393					1175	...	2.14	101
Bleriot Spad 81	Tr-Bi.	Land Mac.	Fig S.	1	6.60	2.97	No.	9 61	2.00	30	Hispano.....	1	300	Vee...	235	‡	7400	54	2¾	1259	839	4.19	41.9
Bleriot Spad 61	Tr-Bi.	Land Mac.	Fig S.	1	6.78	2 80	No.	9.40	2.00	30	Lorraine.....	1	450	W....	240	‡	7500	47	3	1522	1012	3.45	50.7
Bleriot Spad 51	Tr-Bi.	Land Mac.	Fig S.	1	6.45	3.10	No.	9.47	1.65	26	Bristol.....	1	515	Rad...	220	‡	8200	39	2¾	1276	791	2.70	52.6
Bleriot Spad 56	Tr-Bi.	Land Mac.	Pas & F.	8	9.00	3.50	No.	13.08	2.00	46.8	Bristol.....	1	420	Rad...	200	‡	4750	48	3¾	2310	1160	5.50	50.3
Bleriot 115	Tr-Bi.	Land Mac.	Pas & F.	12	14.45	5.00	No.	25.00	2.60	126	Hispano.....	4	180	Vee...	170	80	3500	59	4½	5150	2950	6.90	39
Bleriot 155	Tr-Bi.	Land Mac.	Pas & F.	19	14.75	5.25	No.	26.00	2.70	135	Renault.....	4	230	Vee...	172	90	3500	58	3	6350	3650	6.90	47
Breguet 19	Tr-Mo.	Land Mac.	Recon...	2	9.51	3 34	No.	14.83	2.25	50	Lorraine.....	1	400	Vee...	220	70	5000	29	4½	2020	2020	5.00	40
Breguet 19	Tr-Mo.	Land Mac.	Recon...	2	9.51	3.34	No.	14.83	2.25	50	Lorraine.....	1	450	Vee...	228	70	5000	22	4½	2229	1963	4.95	45
Breguet 19	Tr-Mo.	Land Mac.	Recon...	2	9.51	3.34	No.	14.83	2.25	50	Renault.....	1	480	Vee...	225	70	5000	29	4½	2347	2347	4.90	47
Breguet 19	Tr-Mo.	Land Mac.	Recon...	2	9.51	3.34	No.	14.83	2.25	50	Hispano Suiza.	1	450	Vee...	230	70	5000	21	4½	2259	2027	5.02	46
Breguet 19T	Tr-Mo.	Land Mac.	Pas & F.	7	9.51	3.34	No.	15.20	2.25	51	Rhone.....	1	420	Rad...	215	80	2000	9	7½	2600	2600	6.20	52
C.A.M.S. 33C	T&PBi.	Flying B.	Pas & F.	6	13.32	4.60	No.	17.62	2.90	92	Hispano.....	2	550	Vee...	193	95	3000	40	7	4100	1460	7.45	44.56
C.A.M.S. 37	Pu-Bi.	Amphib.	Del. F.	3	11.53	4.04	Yes.	14.50	2.40	58	Lorraine.....	1	450	W....	180	90	3000	20	4	2550	850	5.66	43.86
C.A.M.S. 46E	Pu-Bi.	Flying B.	Adv-Tr.	2	9.04	2.97	No.	12.	1.80	37	Hispano.....	1	150	Vee...	153	67	2000	17	3	1230	270	8.20	33.
Caudron C 103	Tr-Bi.	Land Mac.	Recon.	2	8.68	3.30	No.	14.55	.....	42	.....	...	450	....	224	....	5000	29	....	2097	511	3.66	50.0
Denhaut	Tr-Bi	Amphib	Day B	5	17.00	5.10	....	24.00	.....	116	Bristol.....	2	760	Rad...	170	80	3500	35	8	5000	2000	6.8	45
Farman F 121	T&PBi.	Land Mac.	Pas & F.	14	14.00	4.48	No.	19.00	6.3	81.0	Hispano Suiza.	4	720	Vee...	210	‡	‡	‡	‡	5060	2000	7.02	62.5
Farman Super-Goliath	T&PBi.	Convert.	Pas & F.	....	....	....	No.	....	....	....	Own.....	4	2000	Vert.	182	....	4000	27¾	....	....	....	....	....
Farman F 130	Tr-Bi.	Land Mac.	Nig B.	2	14.15	4.95	No.	25.35	3.06	150	Own.....	1	600	W....	175	90	5000	60	4½	5600	2400	9.34	37.4
Hanriot 31	Tr-Bi.	Land Mac.	Fig S.	1	7.00	3.20	No.	12.20 U 9.10 L	2.00U 1.45L	34.0	Salmson.....	1	500	Rad...	255	101	8000	‡	2½	1800	375	3.6	53
Hanriot 33	Tr-Bi.	Land Mac.	Fig S. Recon.	2	3.36	3.48	No.	12.53 U 10.74 L	2.00U 1.7 L	37.5	Salmson.....	1	500	Rad...	240	95	7500	‡	2½	1835	479	3.79	49.2
Hanriot 34	Tr-Mo.	Land Mac.	Ele Tr.	2	6.96	2.75	No.	11.40	2.10	22.0	Rhone.....	1	80	Rad...	130	60	4500	‡	3	646	175	8.07	29.4
Hanriot 35	Tr-Mo.	Land Mac.	Adv-Tr.	2	7.47	2.85	No.	11.4	2.10	22.0	Hispano Suiza.	1	180	Vee...	190	80	6000	‡	3	915	200	5.1	41.5
Hanriot 36	Tr-Mo.	Land Mac.	Ele Tr.	2	7.25	2.75	No.	11.4	2.10	22.0	Salmson.....	1	120	Rad...	150	70	5500	‡	3	750	175	6 25	34
Hanriot 38	Tr-Bi.	Flying B.	Recon.	3	10.00	2.90	No.	14	2.85	50.0	Hispano Suiza.	2	360	Vee...	170	80	5200	‡	4	2218	592	6.44	46.4
Hanriot 14S	Tr-Bi.	Land Mac.	Dusting	2	7.25	3.20	No.	10.26	1.70	34 9	Rhone.....	1	80	Rad...	120	45	4000	‡	2½	780	170	9.7	22.9
††Latecoere Lat 15	Tr-Mo.	Land Mac.	Pas & F.	6	11.80	3.30	No.	18.00	.....	54.0	Lorraine.....	2	440	W....	130	....	....	....	....	3100	1400	7.05	57.4
Latecoere Lat 6	T&PBi.	Land Mac.	Day B.	4	15.70	4.30	No.	27.70	.....	120.0	Jupiter.....	4	1600	Rad...	200	....	....	....	....	6550	1550	4.10	54.6
Latham T&PBi.	Seaplane.	Pas & F.	....	20.81	6.82	No.	33.50	.....	255	Lorraine.....	4	1600	W....	160	....	2000	21	....	10950	3950	6.85	43.0
Loire Gourdou Leseurre.23TS	Tr-Mo.	Land Mac.	Ambul.	2	.....	.....	No.	.....	.....	.....	Hispano Suiza.	1	180	Vee...	.....	.....	.....	.....	.....	.....	.....	.....	.....
Loire Gourdou Leseurre.32-Cl	Tr-Mo	Land Mac.	Fig S.	2	7.55	2.95	No.	12.20	2.08	25	Jupiter.....	1	420	Rad...	250	90	5000	12	2½	1370	586	3 26	54.8
Loire Gourdou Leseurre.33-Cl	Tr-Mo.	Land Mac.	Fig S.	2	8.03	2.95	No.	12.20	2.08	25	Lorraine.....	1	450	W....	250	90	5000	15	3	1548	409	3 44	62.0
Loire & Olivier Leo 7	Tr-Bi.	Land Mac.	De F.	2	‡	‡	‡	‡	‡	68	Hispano Suiza.	2	600	Vert.	195	170	6000	60	3½	360	1130	10	45
Liore & Olivier Leo 12	Tr-Bi.	Land Mac.	Nig B.	2	‡	‡	‡	‡	‡	105	Lorraine.....	2	800	Vert.	206	190	5500	60	4	4600	2100	6	44
Liore & Olivier Leo 12S	Tr-Bi.	Land Mac.	Pas & F.	19	‡	‡	‡	‡	‡	105	Bristol.....	2	840	Rad...	200	185	2000	8	4	5300	2800	6.3	50
Liore & Olivier Leo H13	Tr-Bi.	Flying B.	Recon.	2	‡	‡	‡	‡	‡	68	Hispano Suiza.	2	360	Vert.	145	160	3000	38	3	2600	550	7.3	43
Liore & Olivier Leo H13S	Tr-Bi.	Amphib.	Recon.	2	‡	‡	‡	‡	‡	58	Renault.....	1	300	Vert.	150	160	3000	38	4	2840	800	9	48
Liore & Olivier Leo H134	Tr-Bi.	Flying B.	Sport.	7	‡	‡	‡	‡	‡	58	Lorraine.....	1	450	W....	178	170	2000	22	3	2840	800	7	68
Liore & Olivier Leo H15	Tr-Bi.	Land Mac.	Pas & F.	14	‡	‡	‡	‡	‡	136	Bristol.....	3	1140	Rad...	180	170	2000	16	4	6640	2000	5.8	48
Morane-Saulnier 50	Tr-Mo.	Land Mac.	Ele-Tr.	3	760	3.10	No.	11.70	2.20	24	Salmson.....	1	120	Rad...	168	60	2000	16	3	960	250	8	40
Morane-Saulnier 50C	Tr-Mo.	Land Mac.	Ele-Tr.	3	760	3.10	No.	11.70	2.20	24	Clerget.....	1	130	Rot....	170	60	2000	15	3	960	250	7.4	40
Morane-Saulnier 53	Tr-Mo.	Land Mac.	Adv-Tr.	2	7	2.80	No.	10.60	2.30	20	Hispano Suiza.	1	180	Vee...	200	75	5000	29	2½	1000	170	5.55	50
Morane-Saulnier 51	Tr-Mo.	Land Mac.	Adv-Tr.	2	8	3.10	No.	11.70	2.20	24	Hispano Suiza.	1	180	Vee...	188	65	5000	32	3	1080	170	6	45
Morane-Saulnier 35	Tr-Mo.	Land Mac.	Ele-Tr.	2	6.8	3.6	No.	10.56	1.80	18	Gnome & Rhone	1	80	Rot....	135	60	2000	15	3	710	170	9	39.8
Nieuport-Delage 38	Tr-Bi.	Land Mac.	Pas & F. Ele-Tr.	4	8.11	3.44	No.	10 90	2.05	40.3	Hispano Suiza. Renault.....	1 1	180 170	Vee... Vee...	161	72	4000	60	4	1400	300	7.70	34.70
Nieuport-Delage 42	Tr-Ses.	Land Mac.	Fig S.	1	7.50	3 00	No.	12.00	2.30	31.25	Hispano Suiza.	1	500	Vee...	275	100	7680	34½	3	1808	310	3.62	58
Nieuport-Delage 44	Tr-Ses.	Land Mac.	Fig S.	1	7.30	3.00	No.	12 00	2.30	31.25	Lorraine.....	1	450	W....	248	100	7000	40	3	1722	310	3 83	55
Nieuport-Delage 46	Tr-Ses.	Land Mac.	Fig S.	1	7.30	3.00	No.	12.00	2.30	31.25	Hispano Suiza.	1	500	W....	260	100	500	25	3	1764	310	3.58	57.2
Potez 25	Tr-Bi.	Land Mac.	Recon.	2	9.00	3.50	No.	14.00	2.50	46.00	Renault.....	1	450	W....	235	75	5000	19	4	1958	510	4.35	42.5
Potez 19	Tr-Bi.	Land Mac.	Pas & F.	12	14.14	4.20	No.	21.31	2.70	112	Hispano Suiza.	3	900	Vee...	195	80	4000	24	6	5560	1690	5.25	42.5
Potez 8	Tr-Bi.	Land Mac.	Sport.	2	5.72	2.50	No.	8	1.40	20	Anzani.....	1	70	Rad...	145	50	2000	16	3	572	175	7.5	27.5
Schreck FBA21	Tr-Bi.	Seaplane.	.....	.....	.....	4.20	No.	14.50	1.90	53¼	Hispano Suiza.	1	450	W....	195	....	2000	12	....	3000	1200	6.6	56
Villiers	Tr-Ses.	Seaplane.	.....	2	11.50	.....	No.	14.0	.....	45	Lorraine.....	1	450	W....	196	....	2000	15	....	.....	.....	.....	.....
GERMAN																							
Albatross L 58	Tr-Mo.	Land Mac.	Pas & F.	7	10.89	3.82	No.	18	3.02	48	Rolls-Royce....	1	360	Vee...	150	60	1000	15	3½	2250	880	6.5	47
Albatross L 68	Tr-Bi.	Land Mac.	Ele-Tr.	2	.....	.....	.....	.....	.....	22	Siemens.....	1	100	Rad...	.....	.....	.....	.....	.....	.....	.....	.....	.....
Albatross L 69	Tr-Mo.	Land Mac.	Sport.	.....	.....	.....	.....	.....	.....	.....	Siemens.....	1	100	Rad...	.....	.....	.....	.....	.....	.....	.....	.....	.....
d.A.G.D. D 2	Tr-Mo.	Land Mac.	Sport.	2	6.8	.....	Yes.	11	.....	12½	Blackburne....	1	18	Vee...	120	.....	.....	.....	.....	330	.....	18.3	26.4
Caspar C 24	Tr-Bi.	Land Mac.	Ele-Tr.	2	7.2	3.0	No.	10.0	1.15	22.0	Mercedes.....	1	100	Vert.	150	20	.....	.....	2½	1000	300	8.5	45.6
Caspar C 26	Tr-Bi.	Land Mac.	.....	2	7.1	3.0	No.	10.0	1.15	22 0	Bristol.....	1	118	Rad...	155	80	.....	.....	2½	900	300	7.0	40.9
Caspar C 27	Tr-Bi.	Seaplane.	.....	2	9.45	4.0	No.	15.0	1.53	48.0	B M W	1	230	.....	145	67	.....	.....	4½	1550	400	6.75	32.3
Daimler L 20	Tr-Mo.	Land Mac.	Sport.	2	7.6	1.7	No.	13.0	1.65	20.0	Own Mercury..	1	20	Hor..	120	45	1000	10	3½	425	170	21.2	21.2
Daimler L 21	Tr-Mo.	Land Mac.	Sport.	2	.....	.....	.....	.....	.....	.....	Own Mercury..	2	38	Hor..	.....	.....	.....	.....	.....	.....	.....	.....	.....
Darmstadt "Mohammed"	Tr-Mo.	Land Mac.	Sport.	1	.....	.....	.....	.....	.....	.....	Blackburne....	1	18	Vee...	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dietrich DP-VIIa	Tr-Mo.	Land Mac.	Sport.	2	6.0	2.2	Yes.	9.7	.....	14	Siemens.....	1	55	Rad...	140	....	1000	8	3½	530	210	9 5	38.8
Dietrich DP-IIa	Tr-Bi.	Land Mac.	Ele-Tr.	2	5.9	2.5	No.	7.2	.....	15	Siemens.....	1	80	Rad...	140	....	1000	6	3½	620	220	7 75	41.3
Dietrich D S I	Tr-Bi.	Land Mac.	Ele-Tr.	2	6.8	2.6	....	10.1	.....	24.7	Siemens.....	1	77	Rad...	112	45	1000	9	2	750	220	9.8	30
Dornier Komet III	Tr-Mo.	Land Mac.	Pas & F.	8	12 3	3.4	No.	19.60	3.24	62	Rolls-Royce....	1	360	Vee...	175	85	3500	50	5	2935	1200	8.15	47.2
Dornier Libelle	Tr-Mo.	Flying B.	Ele-Tr.	3	7.2	2.4	Yes	9.8	1.60	16.0	Siemens.....	1	70	Rad...	145	70	1000	15	3	750	300	10.7	51
††Dornier Wal	T&PMo.	Flying B.	Pas & F.	9	16.15	4.30	No.	22.50	4.60	96.00	R.R.Eagle.....	2	720	Vee...	185	85	3500	35	8	5090	1600	17.15	53.0
Fock-Wulf A16	Tr-Mo.	Land Mac.	Pas & F.	4	8.50	2.30	No.	13.90	2.60	27.0	Siemens&Halake	1	100	Rad...	145	70	1000	12	4	1000	400	10	37
Fock-Wulf A16a	Tr-Mo.	Land Mac.	Pas & F.	4	9.10	2.50	No.	14.0	2.60	27 0	Mercedes.....	1	120	Vert.	145	80	1000	12	3½	1200	440	10	41
Fock-Wulf S1	Tr-Mo.	Land Mac.	Sport. Adv-Tr.	2	8.10	2.30	No.	12.0	2.25	22.0	Siemens&Halake Junkers.....	1	55 75	Rad... Vert.	120 135	60 60	1000 1000	12 8	3 3	670 730	200 220	12 10	30 33
Heinkel H D 21	Tr-Bi.	Land Mac.	Ele-Tr.	2	7.3	2.9	No.	10	.....	27.4	Mercedes.....	1	100	Vert.	135	.....	.....	.....	4	980	270	8.7	33.4
Heinkel H D 29	Tr-Bi.	Land Mac.	Adv-Tr. Sport	3	7.2	2.7	No.	10.5	1.5	27 7	Mercedes.....	1	120	Vert.	135	75	3100	52	3½	965	320	8.47	34.8
Heinkel H D 32	Tr-Bi.	Land Mac.	Adv-Tr. Sport	2	6.8	2.7	No.	10.5	1.4	23.6	Siemens.....	1	100	Rad...	145	75	3800	55	3½	850	280	8.5	36
Heinkel H D 35	Tr-Bi.	Land Mac.	Ele-Tr.	3	7.5	2.7	Opt.	11.0	1.55	32.4	Mercedes.....	1	120	Vert.	130	65	3000	46	3½	950	300	8.0	29
Junkers F 13	Tr-Mo.	Land Mac.	Pas & F.	6	9.6	3.3	....	17.8	3.0	40.0	Own.....L-II	1	195	Vert.	160	80	1000	11	4½	.....	400	.....	.....
Junkers F 13	Tr-Mo.	Seaplane.	Pas & F.	6	10.12	3.6	....	17.8	3.0	40 0	Own.....L-II	1	195	Vert.	150	80	1000	14	4	.....	400	.....	.....
Junkers K 16	Tr-Mo.	Land Mac.	Pas & F.	3	8.04	2.75	....	11.0	1.8	15.2	Siemens.....6	1	100	Rad...	145	85	.....	.....	2	.....	280	.....	.....
Junkers A 20	Tr-Mo.	Land Mac.	Mail C.	2	8.3	2.95	....	15.35	2.25	26.0	Mercedes.....	1	160	Vert.	170	80	.....	.....	4	.....	400	.....	.....
Junkers A 20	Tr-Mo.	Land Mac.	Nig B.	2	8.3	2.9	No.	15.3	.....	28.1	Mercedes.....	1	160	Vert.	170	....	.....	.....	.....	1500	540	9.4	53.3
Junkers G 23	Tr-Mo.	Convert.	Pas & F.	12	16	5.5	No.	29	.....	.....	Own.....	1	395	Vert.	.....	.....	.....	.....	.....	.....	.....	.....	.....
											Mercedes.....	2											

Foreign Airplane Specifications—Continued

MAKE AND MODEL	CHARACTERISTICS: Class	CHARACTERISTICS: Type	CHARACTERISTICS: Designed For	GENERAL DIMENSIONS (meters): Seating Capacity (Incl. Pilot)	GENERAL DIMENSIONS (meters): Length	GENERAL DIMENSIONS (meters): Height	GENERAL DIMENSIONS (meters): Wings of Folding Type?	GENERAL DIMENSIONS (meters): Main Wings: Span	GENERAL DIMENSIONS (meters): Main Wings: Chord	GENERAL DIMENSIONS (meters): Main Wings: Total Area	ENGINE: Make	ENGINE: Number	ENGINE: Total Horse Power	ENGINE: Type	PERFORMANCE: Speed (Kilo. Per Hr.): Full Throttle	PERFORMANCE: Speed (Kilo. Per Hr.): Landing	PERFORMANCE: Climb: Altitude (M.)	PERFORMANCE: Climb: Minutes	PERFORMANCE: Endurance at Cruising Speed (Hrs.)	WEIGHTS (kilos): Fully Loaded	WEIGHTS (kilos): Useful Load	WEIGHTS (kilos): Per H.P.	WEIGHTS (kilos): Per Square Meter of Surface
GERMAN—Cont.																							
Junkers.....G 24L	Tr-Mo..	Convert...	Pas & F.	12	15.3	5.4	No..	20.9	.....	89	Own.....	3	690	Vert..	175	105	1000	8	9	6000	2400	13.8	19.1
Junkers.....T 26	Tr-Mo..	Land Mac.	Sport...	2	7.54	2.72	....	13.15	2.0	21.5	Own L 1.....	1	80	Vert..	130	80	1000	10	3	.....	230	.....	.....
Junkers.....T 26	Tr-Mo..	Land Mac.	Sport...	2	7.54	2.72	....	10.0	1.45	33.5	Own L 1.....	1	80	Vert..	115	60	1000	13	3	.....	230	.....	.....
Junkers.....T 29	Tr-Mo..	Land Mac.	Ele-Tr..	3	8	2.8	....	12.8	.....	18.9	Siemens.....	1	75	Rad..	150	.....	.....	.....	.....	850	315	11.3	45.0
L.F.G.....“Forsterhof”	Tr-Bi...	Land Mac.	Ele-Tr..	2	7.9	3.4	No..	12 4	1.00	40	Mercedes.....	1	120	Vert..	125	55	1000	8	4	1130	285	9.4	28.3
L.F.G.....V 40	Tr-Mo..	Land Mac.	Sport...	2	7.2	2.4	No..	11.4	1.60	18	Siemens.....	1	75	Rad..	120	68	1000	8	3½	840	305	11.2	46.7
L.F.G.....V 42	Tr-Mo..	Land Mac.	Sport...	2	7.7	2.6	No..	12.6	1.90	24	Mercedes.....	1	100	Vert..	145	68	1000	8	3½	1069	370	9.0	44.5
L.F.G.....V 44	Tr-Mo..	Land Mac.	Sport...	2	7.2	2.3	No..	11.4	1.60	18	Bristol.....	1	100	Rad..	150	68	1000	8	3½	840	305	8.4	46.7
L.F.G.....V 52	Tr-Mo..	Land Mac.	Sport...	2	7.0	2.0	No..	10.0	1.45	14½	Siemens.....	1	55	Rad..	145	60	1000	8	3½	550	205	10.0	37.9
L.F.G.....Strela V 13	Tr-Bi...	Convert...	Pas & F.	6	10.9	3.9	No..	17.5	2.35	70	B M W.....	1	220	Vert..	145	70	1000	8	2½	2135	792	10	31.4
Messerschmidt.....M 17	Tr-Mo..	Land Mac.	Sport...	2	5.8	1.5	....	11.6	.....	10.4	Bristol.....	1	25	Hor...	159	.....	.....	.....	.....	370	190	14.8	35.6
Rohrbach.....R-III	Tr-Mo..	Flying B..	Pas & F.	...	17.2	.....	No..	28.8	.....	.....	Rolls-Royce....	2	720	Vee...	200	.....	.....	.....	.....	6200	2450	8.6	.....
Stahlwerk.....M E-2	Tr-Mo..	Land Mac.	Ele-Tr.. Sport	2	5.2	2.0	....	9.4	.....	12.9	Own.....	1	35	Rad..	.....	.....	.....	.....	.....	385	.....	11.0	29.8
Udet.....Kolibri U-7	Tr-Mo..	Land Mac.	Sport...	1	5.5	1.8	No..	10.0	.....	12.5	A.B.C.....	1	25	Hor...	120	50	1000	5	5	300	100	12	24.0
Udet.....U 8a	Tr-Mo..	Land Mac.	Sport...	4	.....	.....	No..	.....	.....	19.0	.....	1	100	Rad..	140	....	.....	.....	....	1030	400	10.3	47.7
Udet.....U 10a	Tr-Mo..	Convert...	Ele-Tr.. Sport	2	5.9	2.0	No..	10.6	.....	15	Siemens.....	1	60	Rad..	145	....	1000	10	....	570	220	9.5	38.0
Udet.....Flamingo U-12	Tr-Bi...	Land Mac.	Ele-Tr.. Adv-Tr.	2	6.7	2.8	No..	10.0	.....	24.0	Siemens.....	1	80	Rad..	140	....	1000	7	....	800	300	10.0	33.3
ITALIAN																							
Caproni.....80	T&PBi..	Land Mac.	Nig B...	6	.....	.....	.....	.....	.....	.....	Bristol.....	2	850	Rad..	175	71	1000	5½	....	4800	3300	5.65	.....
††Caproni.....1924	Tr-Mo..	Land Mac.	Fig S...	1	6.81	2.42	No..	10.00	.....	18.76	Hispano Suiza..	1	300	Ver..	277	105	5000	12	3	1000	300	3.30	54.0
Fiat.....B R 1	Tr-Bi...	Land Mac.	Day B...	2	10.47	3.91	No..	17.3	.....	77	Fiat.....	1	700	Vee...	245	95	3000	16¾	4	3900	1500	5.57	50.4
Gabardini.....G 4	Tr-Bi...	Land Mac.	Ele-Tr..	2	6.20	2.30	No.	7.71	1.575U	19	LeRhone.....	1	80-110	Rot..	170	60	5500	....	5	630	200	5.3	33
Gabardini.....G 7	Tr-Bi...	Land Mac.	Sport...	2	6 43	2.42	No.	9.10	1.78U	25	Own T 3.....	1	60	Rad..	120	55	.....	.....	3½	470	200	7 8	18.8
Gabardini.....G 7	Tr-Bi...	Seaplane...	Sport...	2	6.43	2.42	No.	9.10	1.78U	25	Own T 3.....	1	60	Rad..	110	60	.....	.....	2½	500	180	8.3	20
Gabardini.....G 8-140	Tr-Bi...	Land Mac.	Adv-Tr..	2	6.70	2.53	No.	8.35	1.78U	22.17	Hispano Suiza..	1	140	Vee...	180	95	6000	.....	2	901	220	6.4	40.5
Gabardini.....G 8-200	Tr-Bi...	Land Mac.	Adv-Tr..	1	6.70	2.53	No.	8.35	1.78U	22.17	Hispano Suiza..	1	200	Vee...	212	95	7000	.....	2½	917	192	6.5	41.2
Macchi.....M20	Tr-Bi...	Land Mac.	Sport...	2	5.90	2.30	No.	7.89	1.30	19.5	Anzani.....	1	45	Rad..	126	66	4000	50	3½	515	225	11.4	26.4
Macchi.....M20	Tr-Bi...	Seaplane...	Sport...	2	5.90	2 60	No.	7.89	1.30	19.5	Lawrence.....	1	55	Rad..	135	66	4000	48	3½	585	225	10.6	29.5
Macchi.....M24b	Tr-Bi...	Flying B..	Pas & F.	9	14.0	34.60	No.	21.73	2.75	100	Lorraine.....	2	800	Vee...	175	100	4000	60	5	5000	1700	6.25	50.0
Macchi.....M33	Tr-Mo..	Flying B..	Racing..	1	8.34	3.28	No.	9.74	1.80	15	Curtiss.....	1	400	Vee...	325	130	.....	.....	1¾	1280	280	3.20	85.2
Magni.....Vitt 24	Tr-Ses..	Land Mac.	Sport...	1	4.90	2.23	No.	8.00	.....	11	Anzani.....	1	50	Rad..	.....	.....	.....	.....	.....	274	128	5.08	24.5
††Savoia.....12	Pu Bi...	Flying B..	Day B...	2	11.50	3.80	No.	15.00	2.20	52.20	Ansaldo.....	1	450	4 “X”	222	120	4000	29	4.00	1600	2400	3.66	30.6
††Savoia.....S13	Pu Bi...	Flying B..	Fig S...	2	9.00	3.10	No.	11.00	1.90	32.80	Isotta-Frasch..	1	250	Ver...	200	110	5000	42	4.00	.....	475	.....	.....
††Savoia.....S16	Pu Bi...	Flying B..	Pas & F.	6	9.90	3.60	No.	15.50	2.20	59.10	FIAT.....	1	300	Vee...	165	90	3000	48	6.00	.....	800	.....	.....
††Savoia.....MVT	Tr-Bi...	Land Mac.	Pas & F.	1	7.20	2.70	No.	8.70	.....	42.00	SPA.....	1	220	Ver...	250	100	5000	17	2.00	.....	230	.....	.....
††Savoia.....S51	Pu Bi...	Flying B..	Day B...	1	9.90	.....	No.	.....	.....	.....	Hispano Suiza..	1	300	Vee...	280	105	5000	27	3.00	.....	320	.....	.....
††Savoia.....S53	Pu Ti...	Flying B..	Pas & F.	5	9 90	3.60	No.	15.50	2.20	59.10	Hispano Suiza..	2	260	Vee...	150	90	3000	48	4.00	.....	760	.....	.....
††Savoia.....S55	T&PTr.	Flying B..	Day B..	6	16.00	3.60	No.	.....	.....	93.00	FIAT.....	2	1220	Vee...	150	90	3000	45	4.00	.....	4300	.....	.....
††Savoia.....S56	Pu Bi...	Flying B..	Ele Tr..	3	8 00	2.50	No.	.....	.....	28.00	LeRhone.....	2	220	Rot...	130	65	3000	35	4.00	.....	160	.....	.....
††Savoia.....S166	Pu Bi...	Flying B..	Day B...	2	9 89	3.67	No.	15.50	.....	53.00	FIAT A12.....	1	300	Ver...	165	95	3000	36	5.00	2420	700	8.07	45.6
DUTCH																							
Koolhoven.....F K 31	Tr-Mo..	Land Mac.	Recon..	2	8.30	3.30	No.	12.00	2.20	24	Bristol.....	1	420	Rad..	235	70	5000	25	4	1760	710	4.45	73.4
Koolhoven.....F K 32	Tr-Bi...	Land Mac.	Adv. Tr.	2	7.10	3.15	No.	8.00	1.35	20	Clerget.....	1	130	Rot...	150	62	2000	8	4	870	260	6 6	43.5
Koolhoven.....F K 29	Tr-Bi...	Land Mac.	Pas & F.	3	7.10	3.00	No.	10.00	1.50	25	Bristol Lucifer..	1	100	Rad...	150	65	1000	5	4	900	445	9.0	36.0
Koolhoven.....F K 23	Tr-Bi...	Land Mac.	Fig S...	1	6.30	1.90	No.	8.20	1.10	18	Siddeley Lynx..	1	200	Rad...	250	80	5000	14	3½	640	360	3.2	35.55
Koolhoven.....F K 33	T&PMo.	Land Mac.	Pas & F.	12	17.50	4 75	No.	24.70	4.50	100	Siddeley Puma..	3	720	Vert..	188	65	1000	7	6	5000	2000	7.0	50.0
Koolhoven.....F K 34	Tr-Mo..	Seaplane...	Recon...	3	9.60	3.75	No.	13.00	3.25	28	Hispano.....	1	450	W....	200	80	3000	20	4	2200	780	5.0	78.6
Fokker.....C V B	Tr-Bi...	Land Mac.	Recon...	2	9.3	3.3	No.	13.2U	2.0U	40.8	Liberty.....	1	400	Vee...	215	85	5000	46	6	2180	800	5.4	53.4
Fokker.....C V C	Tr-Bi...	Land Mac.	Recon...	2	9.6	3.4	No.	14.6U	2.2U	46	Hispano.....	1	520	Vee...	230	85	5000	28	9.5	2450	1000	4.7	53.3
Fokker.....C V ıs	Tr-Bi...	Land Mac.	Recon...	2	9.3	3 3	No.	13.2U	2.0U	40 8	Bristol.....	1	440	Rad...	225	85	5000	27	5.5	2030	800	4 6	49.8
Fokker.....C V D	Tr-Bi...	Land Mac.	Recon...	2	9.5	3.3	No.	4.5U	4.86U	29	Hispano.....	1	520	Vee...	255	92	5000	14.5	4	1910	600	3.7	65 9
Fokker.....D XIV	Tr-Mo..	Land Mac.	Fig S...	1	7 9	2.5	No.	10.8	2.3U	17.6	Hispano.....	1	400	Vee...	275	100	5000	14.3	3	1350	400	3 4	76.8
Pander.....	Tr-Mo..	Land Mac.	Sport...	1	4.95	1.65	No..	.....	8.0	10.8	Anzani.....	1	25	Rad...	130	50	.....	.....	.....	308	118	12.0	28.5
CZECHOSLOVAKIAN																							
Aero.....A 11	Tr-Bi...	Land Mac.	Recon...	2	8-5	3-0	No..	12.0	1.9	36	Walter.....	1	240	Vert..	215	‡	5000	22	3	1600	500	6.6	40
Aero.....Ab 11	Tr-Bi...	Land Mac.	Recon...	2	8-5	3-0	No.	12 0	1.9	36	Perun.....	1	240	Vert..	215	‡	5000	22	3	1600	500	6.6	40
Aero.....A 11c	Tr-Bi...	Land Mac.	Fig S...	2	8-5	3-0	No.	9 83	1 8	28	Skoda.....	1	450	W....	240	‡	‡	‡	‡	2200	800	4.9	78.5
Aero.....A 24	Tr-Bi...	Land Mac.	Nig B...	3	12-5	4-5	Yes.	22.5	2 5	105	Maybach	2	480	Vert..	150	‡	‡	‡	‡	4000	1600	8.3	39
Aero.....A 25	Tr-Bi...	Land Mac.	Adv Tr..	2	8-5	3-0	No.	12.0	1 9	36	Perur.....	1	185	Vert..	190	‡	‡	‡	‡	‡	‡	‡	‡
Aero.....A 19	Tr-Bi...	Land Mac.	Adv Tr	1	6-3	2-7	No..	8.4	1.4	19.4	Perun.....	1	185	Vert..	200	‡	‡	‡	‡	1000	220	5.4	51.5
Avia.....B H 10	Tr-Mo..	Land Mac.	Adv Tr..	1	‡	‡	‡	‡	‡	‡	Walter.....	1	60	Rad.	181	‡	‡	‡	‡	‡	‡	‡	‡
Avia.....B H 21R	Tr-Bi...	Land Mac.	Fig S...	1	‡	‡	‡	‡	‡	‡	Hispano.....	1	380	Vee	301	‡	‡	‡	‡	‡	‡	‡	‡
Avia.....B H 11	Tr-Mo..	Land Mac.	Adv Tr..	2	‡	‡	‡	‡	‡	‡	Walter.....	1	60	Rad..	160	‡	‡	‡	‡	‡	‡	‡	‡
Milit. Air. Works.....S-18	Tr-Bi...	Land Mac	Ele-Tr..	2	6.68	2.65	No..	10	1	17.5	Walter.....	1	60	Rad..	140	68	1000	7	2.5	554	160	9.25	31.6
Milit. Air. Works.....S-19	Tr-Bi...	Land Mac.	Pas & F.	5	8.85	3.27	No.	14.1	1.55	39.9	Maybach.....	1	260	Vert..	178	90	1000	7	5	2004	360	7 7	50.4
Milit. Air. Works.....S-20	Tr-Bi...	Land Mac	Fig S...	1	7.44	2.56	No..	9.7U 8.2L	1.25U .9L	18.3	Skoda.....	1	300	W....	256	130	1000 5000	1½ 13¾	2.5	1050	155	3.5	57.5
Milit. Air. Works.....S-21	Tr-Bi...	Land Mac.	Adv-Tr..	1	7.53	2 53	No..	10.1U 9.9L	1.25U .9L	19.9	Hispano Suiza.	1	180	Vee...	225	110	4600	‡	4	863	85	4 8	43 5
Milit. Air. Works.....S-22	Tr-Bi...	Land Mac.	Fig S...	1	7.65	2.63	No..	10.18	1.6	15.8	Skoda.....	1	450	W....	‡	‡	‡	‡	‡	1280	‡	2.85	81 3
ROUMANIAN																							
Stoika.....	Tr-Ses...	Flying B..	Sport...	2	10.4	.....	No..	15.9	.....	.....	Heiro.....	1	220	Vert..	160	.....	.....	.....	8	1800	.....	8.18	.....

ABBREVIATIONS:

‡—Information not furnished
††—1924 Machines
Adv-Tr—Advanced Training
Ambul—Ambulance
Amphib—Amphibian
Convert—Either Land Machine or Seaplane
Day B—Daylight Bombing
Dek F—Deck Flying
Ele Tr—Elementary Training
Fig S—Fighting Scout
Flying B—Flying Boat
Hor—Horizontal
L—Lower wing
Land Mac—Land Machine
Mail C—Mail Carrying
Nig B—Night Bombing
Pas & F—Passenger and Freight
Pu Bi—Pusher Biplane
Ra Ma—Racing Machine
Rad—Radial
Recon—Reconnaissance
Rot—Rotary
Tr Bi—Tractor Biplane
Tr Mo—Tractor Monoplane
Tr Ses—Tractor Sesquiplane
T&PBi—Tractor and Pusher Biplane
T&PMo—Tractor and Pusher Monoplane
U—Upper wing
Vee—Vee
Vert—Vertical
“W”—Three Row Vee

Foreign Airplane Specifications—Continued

MAKE AND MODELS	CHARACTERISTICS			GENERAL DIMENSIONS (ft. ins.)				Main Wings			ENGINE				PERFORMANCE					WEIGHTS (lbs.)			
	Class	Type	Designed for	Seating Capacity Including Pilot	Length	Height	Wings of Folding Type?	Span	Chord	Total Area	Make	Number	Total Horse Power	Type	Speed (Miles Per Hr.) Full Throttle (Sea Level)	Speed (Miles Per Hr.) Landing	Climb Altitude (Ft.)	Climb Minutes	Endurance at Cruising Speed (Hrs.)	Fully Loaded	Useful Load	Per H.P.	Per Square Foot of Surface
BRITISH																							
A.D.C. Martinsyde 1	Tr-Bi	Land Mac.	Fig S.	1	25-0	9-2	No.	32-10	‡	325	Siddeley	1	420	Rad.	162	50	20000	17½	2.6	2800	880	6.67	8.61
A.D.C. Avro	Tr-Bi	Land Mac.	Ele Tr.	2	29-0	10-6	No.	36-0	4-9¾	330	ADC Airdisco	1	140	Vee	90	36	8000	21½	3½	2114	650	15.1	6.4
A.N.E.C.	Tr-Mo	Land Mac.	Sport	1	15-7	.....	No.	18-4	.....	.....	Anzani	1	....	Vee	....	....	....	....	....	530	.....	.....	.....
A.N.E.C.	Tr-Bi	Land Mac.	Nig F.	6	55	14	Yes.	110	.....	.....	Siddeley	3	750	Vert.	85	....	....	....	....	9000	2000	13	5
Armstrong-W. Argosy	Tr-Bi	Land Mac.	Pas & F.	22	46-6	19	No.	90	12 10	893	Siddeley	3	1155	Rad.	110	50	10000	40	4½	17000	4500*	14.8	9
Armstrong-W. Aiax	Tr-Bi	Land Mac.	Recon.	2	27-3	10-8	No.	39-4½U 29-4 L	6-6.85U 5-6⅞L	384	Siddeley	1	385	Rad.	142	54	10000	‡	4½	3800	1000	10	10
§Armstrong-W. Siskin V	Tr-Bi	Land Mac.	Fig S.	1	21-4	9-4	No.	28-4 U 22-3 L	6-0U 5-0L	256	Siddeley	1	385	Rad.	160	55	10000	6.1	2½	2460	450	6.4	9.7
Austin. Whippet	Tr-Bi	Land Mac.	Sport	1	16	.....	Yes.	21-6	.....	150	Anzani	1	50	Rad.	85	35	5000	10	....	810	230	16.2	5.66
Avro. 504-K	Tr-Bi	Land Mac.	Ele Tr	2	28-0	10-9	No.	36-0	4-9¾	320	Gnome	1	100	Rot	82	37	10000	30	....	1818	598	16.1	5.68
Avro. 504-N	Tr-Bi	Land Mac.	Adv Tr.	2	28-0	10-9	No.	36-0	4-9¾	320	Siddeley Lynx	1	180	Rad.	95	40	10000	17½	....	2056	604	11.4	6.43
Avro. 504 O	Tr-Bi	Seaplane	Adv Tr.	2	32-1	11-10	No.	36-0	4-9¾	320	Siddeley Lynx	1	180	Rad.	92	42	10000	27½	....	2544	610	14.15	7.85
Avro. 552	Tr-Bi	Seaplane	Adv Tr.	2	32-1	11-10	No.	36-0	4-9¾	320	Wolseley-Viper	1	210	Vee	98	48	10000	27	....	2704	604	12.88	8.45
Avro. 552 A	Tr-Bi	Land Mac.	Adv Tr.	2	28-0	10-9	No.	36-0	4-9¾	320	Wolseley-Viper	1	210	Vee	104	43	10000	15½	....	2304	604	10.98	7.2
§Avro. 555	Tr-Bi	Land Mac.	Dek F.	4	37-0	13-0	Yes.	46-0	8-0	630	Napier Lion	1	450	W	100	45	10000	26½	....	5800	2020	12.9	9.2
Avro. 563	Tr-Bi	Land Mac.	Pas & F.	14	51-7	16-2	Yes.	68-0	8-6	1064	Rolls-Royce	1	680	Vee	110	50	10000	43¾	....	11300	6900	16.48	10.5
Beardmore. Wee Bee	Tr-Mo	Land Mac.	Sport	2	22-2	.....	No.	38-0	.....	187	Bristol	1	34	Hor.	86	36	2100	.....	....	837	275	24.6	4.47
Beardmore. XXVI	Tr-Bi	Land Mac.	Fig S.	2	.....	.....	No.	37-0	.....	356	Rolls-Royce	1	360	Vee	145	....	15000	20	4	3980	1425	11.0	11.2
Blackburn. Velos	Tr-Mo	Seaplane	Tor C.	....	36	12-6	No.	48	.....	.....	Napier Lion	1	450	W	‡	‡	‡	‡	‡	‡	‡	‡	‡
Boulton. "Bugle"	Tr-Bi	Land Mac.	Day B.	3	39-9	14-0	No.	62-6	8-6 7-6	932	Bristol	2	800	Rad.	120	56	10000	15½	4½	8760	3681	9.7	9.2
Bristol. Elementary Training	Tr-Bi	Land Mac.	Ele Tr.	2	24-4¼	9-3½	No.	31-4⅛	5-3	284.5	Bristol	1	120	Rad.	85	49	5000	17½	3	1740	.....	14.5	6.12
Bristol. Taxi	Tr-Bi	Land Mac.	Pas & F.	3	24-4¼	9-3½	No.	31-1⅛	5-3	292	Bristol	1	120	Rad.	85	50	5000	20	3½	2000	340†	16.6	6.85
Bristol. Jupiter F 2B	Tr-Bi	Land Mac.	Recon.	2	25-0	10-1	No.	39-3	5-6	405	Bristol	1	400	Rad.	130	50	10000	8½	3½	3250	227†	8.12	8.03
Bristol. Rolls F 2B	Tr-Bi	Land Mac.	Recon.	2	25-9	10-1	No.	39-3	5-6	405	Rolls-Royce	1	265	Vee	115	50	10000	14¾	2½	3100	185†	11.7	7.65
Bristol. Hispano F 2B	Tr-Bi	Land Mac.	Recon.	2	25-6	10-1	No.	39-3	5-6	405	Hispano Suiza	1	300	Vee	112	50	10000	12	2¼	2970	215†	9.9	7.34
Bristol. Bloodhound	Tr-Bi	Land Mac.	Fig S.	2	26-6	10-8	No.	39-11½	7-0	487	Bristol	1	400	Rad.	126	50	10000	14⅓	5¼	4236	471†	10.58	8.70
Bristol. Freight	Tr-Bi	Land Mac.	Pas & F.	2	44-9	14-4	No.	54-⅞	9-1½	894	Bristol	1	400	Rad.	103	50	5000	15	4½	6100	900†	15.25	6.82
Bristol. Lucifer	Tr-Bi	Land Mac.	Adv-Tr.	2	24-3	8-6	No.	31-2	.....	285	Bristol	1	100	Rad.	89	....	1000	2⅝	6	1660	480†	16.6	6.82
Cranwell	Tr-Mo	Land Mac.	Sport	1	18-6½	5-9	No.	21	.....	70	Bristol	1	34	Hor.	.....	.....	.....	.....	.....	530	205	15.6	7.6
De Havilland. D.H.54	Tr-Bi	Land Mac.	Pas & F.	16	51-6	16-6	No.	68-0	8-0	1005	Rolls-Royce	1	650	Vee	120	52	10000	22	4½	11250	3027	17.3	11.2
De Havilland. D.H.60	Tr-Bi	Land Mac.	Sport	2	23-6	8-6	Yes	28	4-3	229	A.D.C.	1	60	Vert.	90	40	10000	45	4	1350	400	22.5	5.9
English Electric. Wren	Tr-Mo	Land Mac.	Ele Tr.	1	2⅓-3	6-2	No.	37-0	4-Da	150	A.B.C.	1	7	Hor.	50	25	170	1	1½	413	158	22.5	2.75
English Electric. Kingston	Tr-Bi	Flying-B.	Recon.	7	52-6	21-2	No.	85-6	9-0	1341	Napier	2	900	W	106	60	500	1	6	14100	5750	15.6	10.5
English Electric. Ayr	Tr-Bi	Flying-B.	Recon.	4	40-8	13-8	No.	46-0	9-0m	466	Napier	1	450	W	‡	‡	‡	‡	‡	‡	‡	‡	‡
Fairey. 111 D	Tr-Bi	Seaplane	Recon.	3	36-0	13-0	Yes.	46-1½	5-6	‡	Napier	1	450	W	117	50	19500	‡	6½	5050	794	11.1	‡
Fairey. Ambulance	Tr-Bi	Seaplane	Recon.	3	36-0	13-0	Yes.	46-1½	5-6	‡	Rolls-Royce	1	375	Vee	101	50	16500	‡	6½	‡	‡	‡	‡
§Fairey. Fawn	Tr-Bi	Land Mac.	Recon.	3	‡	‡	No.	‡	‡	‡	Napier	1	450	W	‡	‡	‡	‡	‡	‡	‡	‡	‡
§Fairey. Flycatcher	Tr-Bi	Amphib	Fig S.	1	‡	‡	No.	‡	‡	‡	Siddeley	1	370	Rad.	‡	‡	‡	‡	‡	‡	‡	‡	‡
Fairey. Pintail	Tr-Bi	Amphib	.....	2	30-0	11-6	No.	40-0	6-0	‡	Napier	1	450	W	‡	‡	‡	‡	‡	‡	‡	‡	‡
Fairey. Fremantle	Tr-Bi	Seaplane	Pas & F.	7	‡	‡	‡	‡	‡	‡	Rolls-Royce	1	650	Vee	‡	‡	‡	‡	‡	‡	‡	‡	‡
§Fairey. Fox	Tr-Bi	Land Mac.	Day B.	2	‡	‡	‡	‡	‡	‡	Curtis D-12	1	450	Vee	‡	‡	‡	‡	‡	‡	‡	‡	‡
Gloucestershire. Grouse II	Tr-Bi	Land Mac.	Adv-Tr.	2	20-0	9-10	No.	27-10	5-3	236	Siddeley	1	180	Rad.	118	52	10000	17	3¾	2120	360	11.8	10.2
Gloucestershire. Grebe II	Tr-Bi	Land Mac.	Fig S.	1	19-4	.....	No.	19-0	5-3	254	Siddeley	1	385	Rad.	152	53	20000	24	2¾	2614	869	6.8	10.3
Gloucesterhire. Gloster 3	Tr-Bi	Seaplane	Rac Ma.	1	‡	‡	No.	‡	‡	‡	Napier	1	700	W	200	‡	‡	‡	‡	‡	‡	‡	‡
Handley Page. "W-9"	Tr-Bi	Land Mac.	Pas & F.	16	60-4	16-9	No.	79-0	10-0	1564	Siddeley	3	1155	Rad.	117	52	900	1	5	14500	5580	12.55	9.27
Hawker. Woodcock 2	Tr-Bi	Land Mac.	Fig S.	1	‡	‡	No.	‡	‡	‡	Bristol "Jup" IV	1	400	Rad.	‡	‡	‡	‡	‡	‡	‡	‡	‡
Hawker. Heron I	Tr-Bi	Land Mac.	Fig S.	1	‡	‡	No.	‡	‡	‡	Bristol "Jup" V	1	400	Rad.	‡	‡	‡	‡	‡	‡	‡	‡	‡
Hawker. Hedgehog I	Tr-Bi	Amphib	Recon.	3	‡	‡	Yes.	‡	‡	‡	Bristol "Jup" IV	1	400	Rad.	‡	‡	‡	‡	‡	‡	‡	‡	‡
††Parnell. Possum	Tr-Tr	Land Mac.	Nig B.	3	‡	‡	‡	‡	‡	‡	Napier	1	450	W	‡	‡	‡	‡	‡	‡	‡	‡	‡
††Parnell. Panther	Tr-Bi	Land Mac.	Dek F.	2	24-11	10-6	No.	29-6	6-3	336	Bentley	1	230	Rot	116	48	10000	12½	5½	2555	1004	11.1	7.6
Supermarine. Racer	Tr-Mo	Seaplane	Rac Ma.	1	‡	‡	No.	‡	‡	‡	Napier	1	700	W	230	‡	‡	‡	‡	‡	‡	‡	‡
CANADIAN																							
Vickers. Avro	Tr-Bi	Land Mac.	Recon.	1	28-11	10-5	No.	36-0	4-9¾	330	Wolseley-Viper	1	200	Vee	‡	‡	‡	‡	‡	2319	688	11.58	7.0
Vickers. Avro	Tr-Bi	Seaplane	Recon.	2	28-11	10-5	No.	36-0	4-9¾	330	Wolseley-Viper	1	200	Vee	‡	‡	‡	‡	‡	‡	‡	‡	‡
Vickers. Avro	Tr-Ni	Seaplane	Recon.	2	28-11	10-5	No.	36-0	4-9¾	330	Wright J4	1	200	Rad.	‡	‡	‡	‡	‡	‡	‡	‡	‡
Vickers. Vedette	Pu-Bi	Flying B.	Recon.	3	22-10	11-9	No.	42-0	6-9	490	Wright J4	1	200	Rad.	92	48	10000	27.5	6	3203	1103	16.01	6.65
§Vickers. Varuna	Tr-Bi	Flying B.	Pas & F.	7	28-2⅝	13-7	No.	55-2½	7-3½	744	Wright J4	2	400	Rad.	‡	‡	‡	‡	‡	5680	1990	14.2	7.6

ABBREVIATIONS:

§—British Air Service Machines
*—Pay load
†—Do not include weights of crew and passenger (s)
††—1924 Machines
‡—Details withheld by British Government
a—Average (tapered)

Adv Tr—Advance Training
Amphib—Amphibian
Day B—Daylight Bombing
Dek F—Deck Flying
Ele Tr—Elementary Training
Fig S—Fighting Scout
Flying B—Flying Boat (hull)
Hor—Horizontal opposed
L—Lower wing

Land Mac—Land Machine
m—Maximum (tapered)
Nig B—Night Flying Bombing
Nig F—Night Flying Commercial
Pas & F—Passenger and Freight
Pu Bi—Pusher Biplane
Rac Ma—Racing Machine
Rad—Radial
Recon—Reconnoissance

Rot—Rotary
Sport—Sport Machine
Tor C—Torpedo Carrier
Tr-Mo—Tractor Monoplane
Tr Bi—Tractor Biplane
U—Upper wing
Vee—Vee
Vert—Vertical
W—"W" (*Three Banks of Cylinders*)

EDITORIAL

Americans as Exporters

TWO young Englishmen, only recently out of college, made a trip to this country to study our industrial organization and methods, and on their return they published their observations, together with some conclusions drawn therefrom, in the form of a pamphlet which has been the subject of much comment in the British press, both favorable and otherwise.

While on the whole their impressions of American methods were very favorable, the authors state it was generally admitted to them that "Americans had very little knowledge of marketing their goods abroad * * * and have a long way to go to compete with Great Britain in the development of selling organizations abroad. * * * We are convinced that the attention of American manufacturers will, for many years to come, be centered on their home market, during which time it will not be necessary for them to make serious attempts to develop foreign markets."

"Who told you that?" asks the British *Motor* editorially, and it continues: "If this be true of any branch of American business activities, it most certainly does not apply to the motor industry. The development of selling organizations abroad has built up the vast export trade of America in motor vehicles. At present exports reach a total of over half a million vehicles, and a big effort is at present in progress, the object of which is to bring the figures beyond the million mark in the year 1928.

"It certainly surprises us to find it put forward seriously that Americans are lacking in ability to place their goods on foreign markets, or that American manufacturers suffer from a lack of foreign selling experience! We know better."

Sharp Edges on Valve Heads

DESIGNERS usually learn at an early stage of their career the importance of avoiding sharp corners, or shoulders, on parts subjected to severe mechanical stresses, as any sudden changes in section concentrate such stresses and are a source of weakness. What is less well known is that sharp edges on parts subjected to high thermal stresses are equally objectionable. This applies particularly to such parts as exhaust valves.

Most exhaust valves have either a screw driver slot or two holes in the head, on the flame-swept side, and the edges of these slots and holes often are left quite sharp. Now, the sharper an edge, the greater the ratio of exposed surface capable of absorbing heat, to the mass of metal back of it capable of storing heat; in the extreme case of a knife edge this ratio becomes practically infinite and the metal assumes the same temperature as the heating medium, that is, the burning gases.

The above is of importance because in an internal combustion engine the compression ratio which can be employed—and, therefore, the thermal efficiency which may be obtained—is limited by that part of the combustion chamber wall which reaches the highest temperature. The exhaust valve head gets hot enough, even if all edges are carefully rounded, and it is a poor policy to invite self-ignition and detonation by leaving any sharp edges on it. This applies as much to the edges at the circumference as to those around the slot or holes for the valve tool.

Cylinder Finishing Terminology

WHEN a technical subject is in a state of rapid development its nomenclature is often somewhat uncertain and confused. At the present time this applies particularly to methods of cylinder finishing. Those who listened to the discussion on the subject before the S.A.E. Detroit Section some time ago, and others who read reports on it, will have had difficulty in following some of the arguments, because of laxness in the use of terms.

In engineering work, when we speak of grinding, we usually refer to an operation performed by means of a rotating abrasive wheel. Of course, the term grinding is used also in different senses, as, for instance, when we speak of grinding valves. But here "grinding" is a contraction of "grinding-in," which is really a synonym for lapping.

By lapping is generally understood the operation of truing a surface by moving two parts over each other after a grinding compound has been applied to their surfaces in contact. One of the parts may be a tool—a lap—which can be used successively on a large number of different pieces of work, or it may be a part which is to be an accurate fit in or on the other one. Lapping always involves the use of an abrasive compound.

It was therefore rather a surprise to hear one of the speakers at the meeting referred to constantly using the term lapping when discussing a method of cylinder finishing by means of abrasive stones.

The example mentioned is only one of a number of ambiguities or uncertainties. This confusion in the terminology of the cylinder finishing art is extremely unfortunate. But since it exists, and probably will continue to exist for some time, it will be a good plan, when hearing anybody either extol or condemn any particular method, to find out the details of the process he is referring to.

AUTOMOTIVE NEWS SECTION INDUSTRIES
Philadelphia, Pennsylvania Thursday, March 4, 1926

Upward Course Followed By Sales and Production

PHILADELPHIA, Mar. 4—The slow but steady expansion of automotive production continued last week, while sales were on a satisfactory level for the season of year. The high rate of present and prospective quantity output of motor vehicles can be gaged from the statement that if current plans are kept unchanged for the next two weeks, there will be at least six and probably seven automobile companies producing more than 1000 vehicles a day, the whole group turning out about 17,000 daily.

This production is based on the expectation that there will be a normal spring-peak in automobile buying. If any general industrial conditions should cause sales to remain stationary or fall off during the next two months, drastic curtailment would of course be necessary at the factories. But there seems no reason not to expect a normal sales season.

Tax Reduction Pleases

The tax reduction in the new revenue bill, both as it directly affects automomiles, trucks, parts, tires and accessories, and as it indirectly affects the market through the greater purchasing power of the public, is regarded as a most favorable development for the industry.

Accessory manufacturers are reporting increased sales of devices which are almost exclusively for ornament and by no means necessary to the running of the car, which is taken to mean a surplus of funds available for purchase of automotive products.

Export conditions are improving daily and it is reasonable to believe that half again as many cars will be sold in overseas territory in 1926 as in 1925.

February Sales Gain

Sales in various centers of the country, as reported by correspondents of *Automotive Industries*, were considerably ahead of the same month a year ago, but there was little, if any gain over January, if an average for the forty-eight states is struck.

The reason for the failure of February to show a pronounced increase appears to be unfavorable weather conditions, especially in the east, where unusually heavy snowfalls were suffered. However, good gains were reported in some sections, and in the others the merchants expressed themselves as satisfied, having in mind the fact that their business was running well ahead of the seasonal level. With such a phenomenal January in back of them, they did not

(Continued on page 435)

364,618 Cars and Trucks in February

Gain of 27% Over February 1925—Year's Output to Date 679,612

NEW YORK, Mar. 3—Based on shipping reports filed at the National Automobile Chamber of Commerce directors meeting today, February production was 364,618 cars and trucks, or 15 per cent ahead of January this year and 27 per cent larger than February, 1925.

Production figures for recent months compared with recent years are:

	1926	1925	1924	1923
January ...	314,994	241,062	324,565	249,423
February ..	364,618	287,213	376,370	283,657

These figures show that while production so far this year is 151,337 ahead of the same period last year and 146,532 larger than the first two months of 1923 it is 21,323 behind the 1924 period. It should be remembered that 1925 turned out to be the industry's record production year and that the total for 1924 showed considerable falling off from the total for 1923, the previous record year. It is also interesting to note that, whereas peak production was reached in May in 1923, and in April in 1924, in 1925 it was not reached until October.

Southern Touring a Factor

While heavy snow slowed up February sales in some places, active snow removal in various states made this much less of a factor in most parts of the country than hitherto. Another element in maintaining winter demand is the large amount of touring below the Mason and Dixon Line. Florida sales have not played a very large part in the southern total, but registrations in all Southern states in the aggregate are increasing more rapidly, according to the N. A. C. C., than in any other part of the country and gains are particularly strong now.

The Chamber regards the Dixie trade, along with the export market, as one of the most promising fields of new business. In Kentucky, for instance, there are 3,876 miles of bus routes, much of these serving communities which had no rapid transport service before.

REEVES SEES 1926 OUTPUT OF 4,300,000

NEW YORK, Mar. 3—Motor vehicle production in 1926 will reach 4,300,000, Alfred Reeves, general manager, National Automobile Chamber of Commerce, declared at the opening session of the automobile selling course at the West Side Y. M. C. A. last night.

The greatest years of growth are still before the industry, Mr. Reeves said in recommending the automobile business to young men. The demand is for high-grade men, he said, as automobile companies are big enterprises and need able personnel.

Tax Provisions Lead to Change in Prices

Many Companies Will Absorb 2 Per Cent on Cars Sold in March

NEW YORK, Mar. 4—Out of the confusion that surrounded the last hurried days when the new tax was being rushed through Congress and signed by the President has come a certain degree of understanding as to the meaning and operation of the automotive sections.

The reduction in the automobile passenger car tax from 5 to 3 per cent will go into effect at midnight, Mar. 28, but already, six days after the signing of the bill by the President, many manufacturers have announced that they will absorb the 2 per cent on cars sold this month, which means immediate reductions in delivered prices ranging from about $11 to more than $100.

Among the companies which have informed their dealers of the tax-cut absorption are Dodge, Hudson, Chrysler, Packard, Paige, Reo, Franklin, Overland.

Under regulations issued by the Internal Revenue Bureau, the dealer may take an inventory of cars in stock on

(Continued on page 425)

Dodge Inaugurates New Service Policy

Garages Chosen by Dealers Will Sell Factory Parts—In Effect by Summer

DETROIT, Mar. 3—Under a service policy announced today by Dodge Bros., Inc., it will be possible for Dodge and Graham owners to obtain genuine parts at reputable repair shops in the United States at a minimum cost.

Such repair shops as do not now handle genuine Dodge and Graham parts will receive them, it was said at the factory, at a discount large enough to eliminate all temptation to use substitute Dodge and Graham parts. In the past, only Dodge Bros. dealers received a discount on parts.

Start Canvassing Campaign

To carry this policy into effect every Dodge Bros. dealer has been asked to canvass his territory for service stations and garages where good workmanship and courtesy prevail with the idea of enlisting them.

It is also announced that a liberal discount on parts is now effective to fleet owners who operate their own service shops. Fleet owners are defined as individuals or corporations owning five or more Dodge or Graham vehicles.

At the factory it was estimated that the new arrangement with independent dealers would immediately give the Dodge Bros., Inc., organization at least 5,000 more points of contact with its car and truck owners.

"Before the end of summer," said a factory executive, "we expect to place signs on all garages chosen by our dealers."

Gardner Reports Capital Surplus of $1,202,098

ST. LOUIS, Mar. 3—The Gardner Motor Co., Inc., reports, as of Dec. 31, 1925, total assets of $1,360,068, as compared with $1,219,750 at the same time in the previous year. Capital surplus was $1,202,098, against $1,200,000 on Dec. 31, 1924. Current assets, including $154,228 cash, were $881,263, and current liabilities were $135,260.

Black & Decker Buys

TOWSON, MD., Mar. 4—Black & Decker Mfg. Co., manufacturer of portable electric tools, announces the acquisition of the patents and properties of the Marschke Mfg. Co., Indianapolis, builder of electric grinders, swing grinders, roll radius grinders, snaggers and buffers for more than a decade.

The purchase of the Marschke plant will be of interest to the trade, as many of the sizes and types of Marschke grinders and buffers start where the present Black & Decker lines leave off.

The plant will continue operations under the supervision of F. W. and W. A. Marschke, founders of the business, in collaboration with the Black & Decker engineering department. The Marschke line will be sold through the jobbers by the present Black & Decker organization.

Tax Provisions Lead to Change in Prices

(Continued from page 424)

Mar. 29 on which he has paid the 5 per cent tax, and may apply to the bureau for a 2 per cent refund on such cars. Blank forms have been printed on which the dealer is to make his claim. The dealer merely schedules his cars on hand or in transit on which title has passed to him. Space is left for the manufacturer to fill in the amount of the tax paid on each car; and a form is prepared whereby the manufacturer waives claims to the refund in favor of the dealer.

The law makes no provision for a refund on trucks, and, therefore, these are not to be included in the inventory. On trucks, parts, accessories, and tires the taxes were eliminated at 10.25 a. m. Feb. 26, when President Coolidge signed the bill. The occupational tax on commercial vehicles was also removed.

Treasury Department blanks containing full instructions are being mailed this week to manufacturers, distributors and dealers throughout the country.

Alfred Reeves, general manager, National Automobile Chamber of Commerce, estimates that the total saving to the industry through the reductions will be $82,150,000 a year. Passenger cars, buses and taxicabs account for $46,400,000, the remainder being divided into $25,000,000 on tires, parts and accessories; $9,000,000 on trucks, and $1,750,000 on automobiles for hire.

57,500 Vehicles to be Chevrolet March Output

DETROIT, Mar. 1—The Chevrolet Motor Co. this month will produce 57,500 passenger cars and trucks, according to W. S. Knudsen, president and general manager of the company. This is 13,660 more than were produced in March, 1925, and is the largest number of modern 3-speed gearshift cars built in a single month by any modern manufacturer, company officials claim.

March production follows the high output which Chevrolet has maintained in January and February, when production was 44,000 and 51,000 respectively. Day and night shifts at the factory are turning out motors at the rate of 135 an hour.

Ford Sells Plant Sites

DETROIT, Mar. 4—The Ford Motor Co. has authorized the sale at private auction of factory properties valued at $7,000,000, located at Philadelphia, Cambridge, Mass., Dallas, Memphis, Louisville and Minneapolis, to make way for the establishment of larger plants at those points.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, Mar. 4—The principal financial development last week was the series of heavy declines in the stock market, carrying prices of more than 200 issues to new low points for the year to date. Trade and industry in general continued at moderately high levels. Commodity prices moved rather sharply downward, while money rates showed signs of increasing firmness.

CAR LOADINGS

Car loadings of revenue freight in the week ended Feb. 13 numbered 917,144, as compared with 914,904 in the preceding week, and 903,935 in the corresponding period last year.

COAL PRODUCTION

Production of bituminous coal and coke declined somewhat during the week ended Feb. 13. Bituminous coal output averaged 2,001,000 tons a day, as compared with 2,028,000 tons in the preceding week, and 1,626,000 tons a year ago.

BUSINESS FAILURES

Business failures reported to Bradstreet's for the week ended Feb. 25 numbered 390, as against 516 in the preceding week, and 378 a year earlier. Failures in February, according to R. G. Dun & Co., totaled 1801, which compares with 2296 in January, and 1793 in February, 1925.

BANK DEBITS

Bank debits to individual accounts reported to the Federal Reserve Board for the week ended Feb. 24 (a holiday week) were 11.9 per cent below the total for the preceding week, but 2.1 per cent above that for the corresponding period last year.

FISHER'S INDEX

Fisher's index of wholesale commodity prices last week recorded the lowest level reached since May of last year. The index stood at 155.5, which compares with 156.6 a week earlier, and 159.7 four weeks earlier.

FEDERAL RESERVE STATEMENT

Bills and securities held by the Federal Reserve banks increased only $500,000 during the week ended Feb. 24, gains of $1,700,000 in discounts and $2,500,000 in open market purchases being nearly offset by a decline of $3,900,000 in Government securities. Note circulation increased $18,200,000, while deposits declined $64,300,000 and reserves $23,600,000. The reserve ratio rose from 73.7 to 74.0 per cent.

MONEY

Money rates in general were somewhat higher last week. Rates on call loans ranged from 5 to 5½ per cent, as compared with 4½ to 5 per cent a week earlier; time loans from 4¾ to 5 per cent, as against 4⅝ to 4¾ per cent; and commercial paper from 4¼ to 4½ per cent, as against 4 to 4½ per cent.

Steel Orders Show Slight Improvement

Greater Volume of Automotive Demand Apparent—Market Lives on Hope

NEW YORK, Mar. 4—Although some of the steel producers still complain that automotive demand is not what they had been led to expect, one can sense that orders and specifications are coming through in greater numbers and, therefore a greater volume of automotive demand may be said to be in evidence, this in spite of a continuance of a relatively light tonnage involved in individual specifications.

In some quarters one hears that demand for full-finished automobile sheets has turned better, and that for strip stock for fenders, lighter. Cold-rolled strip steel is now generally quoted at 4.35c for the 20-gage, approximately $1 a ton under the going price of the middle of February.

Next Fortnight Should Show Trend

The steel market, as a whole, continues to live on hope, and developments over the ensuing fortnight are expected to bring about a change in the trend one way or the other. Some of the sheet and plate producers show more determined resistance to price encroachments, and are turning down business that involves concessions. Such an attitude at times when the market's trend hangs in the balance is by no means a novelty, and past experience has shown that it tends to hasten the development of a more pronounced market tone. Either the demand turns sufficiently strong to furnish the necessary prop for this display of backbone, or such disappointment is in store for these producers that, after having in vain sought to maintain price levels, they usually lead in cutting under the market.

The feeling on both sides of the steel market, among producers as well as consumers, is that the time is at hand when prices must either harden impressively or when concessions will become far sharper and more general than they are now.

Wall Street expects that next Wednesday's unfilled tonnage statement of the U. S. Steel Corp. will show a further decline in its backlog. It is hardly likely that the complimentary orders, which, some of the newspapers reported, had been placed with the corporation as a silver jubilee courtesy, had much of an effect on its carry-over of orders. So far as any direct influence on steel prices is concerned, the only unfilled tonnage statement that could have any effect, would be one showing a marked increase.

The Metal Markets

Pig Iron—Some second-quarter buying of foundry iron must get under way this month, but quite a few automotive melters appear to have made up their minds to continue a hand-to-mouth policy throughout the first half of the year, and to take their chances on single carload supplies. Foreign competition continues to worry blast furnaces. Prices rule easy and are nominally unchanged.

Aluminum—Automotive demand for foundry requirements is good, and there is every indication that consumption of aluminum in alloy die-castings will show a considerable increase in 1926. Pegged prices are easily maintained. The import situation has undergone no change.

Tin—Mar. 1 statistics indicate a contraction in the world supply, and tend to support the high prices prevailing.

Copper—Speculative interest is slightly keener because of the reaction that followed the recent advance. The market for automotive brasses is steady.

Lead—The market has turned rather dull, but producers intimate that more active buying is only a question of days.

Zinc—Artificial curtailment of ore production is looked to for a tonic of which the market is urgently in need if prices that meet producer's ideas are to be maintained.

Vacuum Servo Brake About to be Shown

NEW YORK, Mar. 3—The Dewandre vacuum servo brake is about to be shown to American engineers by Paul Kelecom, who arrived in New York on the Berengaria today.

The Dewandre Co. of Liege, Belgium, had already shipped to America as a demonstration model a 30-hp. 6-cylinder Minerva saloon, with which M. Kelecom will visit all the important automobile manufacturing centres.

Introduced about one year ago, the Dewandre vacuum servo brake, which makes use of the vacuum in the intake manifold, has recently been adopted as standard by Delage, Cottin-Desgouttes, and Georges Irat. Other firms making use of this servo brake are Voisin, Minerva, Isotta-Fraschini, Ballot and Nagant.

The French branch of the Hartford Shock Absorber Co., which has French selling rights for the Dewandre servo brake, is now equipped for adding this device to cars. Conversions are made in 24 hours.

Nash Denies Rumor

KENOSHA, Mar. 1—C. W. Nash, manufacturer of the Nash and Ajax cars, has denied published reports that he had purchased a lumber mill, extensive timber land and a store from the Winchester holdings in northern Wisconsin. Mr. Nash explained that he has been interested in northern Wisconsin as a recreation center for some years, pointing to his recent donation of a log lodge to the Y. M. C. A. as an example, but disclaimed any intention of making business purchases in this section of Wisconsin.

Akron Tire Output Drops in February

Decline of 20%, as Compared With January—Improvement Expected Soon

AKRON, Mar. 4—Production of automobile tires in the Akron district was about 20 per cent smaller during February than in January owing to the decline in retail business. A substantial amount of last month's production also went into warehouses.

While the tire business continues in a temporary lull, indications are that the bottom has about been reached, and that there will be a revival in retail trade and speeding up in factory production before the end of this month.

The sharp break in the crude rubber market within the last few weeks, bringing spot rubber around the 50 cents a pound level, and May, June and July future deliveries considerably below that figure, has brought about a situation which makes another tire price cut almost a certainty.

Some Are Still Bearish

Rubber is now selling at less than half what it was at the beginning of the year, and many tire manufacturers and rubber dealers are still bearish on the market. Manufacturers were actively selling rubber around the 60 cent level last week, but the market appeared to meet with support when it touched 50½ cents at the close of the week.

Tire manufacturers stand to lose rather heavily in some cases on crude rubber inventories, especially if the price of tires goes too low.

On the other hand, the industry will benefit by the drop in rubber in the long run, because a larger volume of sales undoubtedly will follow when tire prices are made cheaper.

Pyrometer Protection Tube is Developed

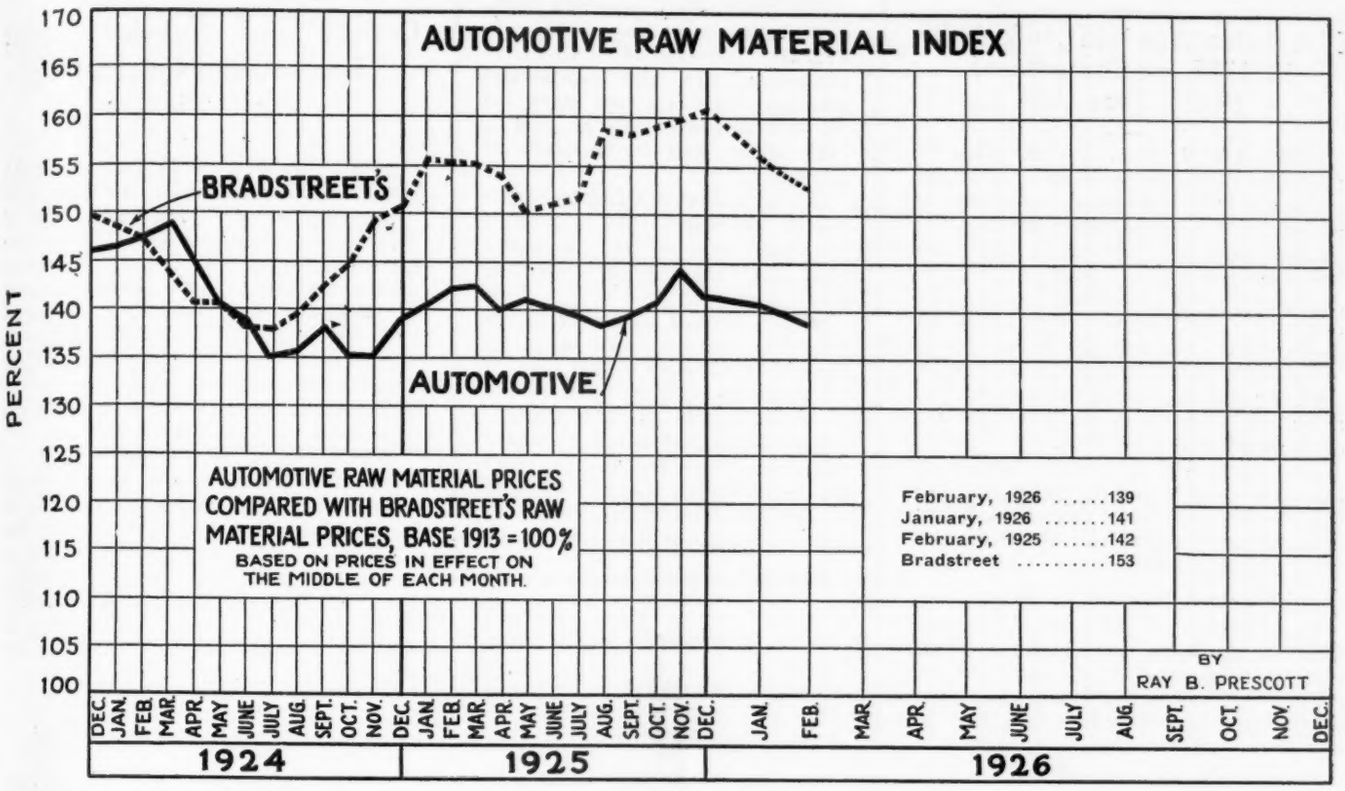
NEW YORK, Mar. 1—A pyrometer protection tube, for which it is claimed that it is highly sensitive and has practically no lag, has been placed on the market by Louis C. Eitzen Co., 280 Broadway. It is known as the Pynolag tube and is made from rolled sheet having a high chromium content, with a wall thickness of 5/64 in.

The tube is claimed to give satisfactory service up to temperatures of 2100 deg. F. and to permit of periodic service up to 2300 deg. F.

Chrysler "80" Sells Well

DETROIT, Mar. 1—Since the introduction of the Chrysler Imperial "80" to the motoring public shortly more than a month ago, 1000 have been delivered to owners by Chrysler distributors and dealers, it was announced at the factory today. The sales represent a value of more than $3,000,000, it is said.

February Raw Material Index Shows Decrease



Dealer Tire, Tube Stocks Show Gain

NEW YORK, Mar. 1—As the result of a questionnaire sent to all its members, the National Tire Dealers Association announced the following:

Average number of tires per dealer in stock Jan. 1, 1926, was 663, as compared with 397 on Jan. 1, 1925.

Average number of tubes per dealer, 1130, as compared with 643 on Jan. 1, 1925.

Average number of solid tires per dealer 141, as compared with 85 on Jan. 1, 1925.

Future surveys by the association will be made quarterly.

General Electric Co. Develops 2 New Welders

SCHENECTADY, Mar. 1—Two automatic resistance welding machines have been developed by the General Electric Co., one for straight seam work and the other for circular seams. With these machines fusion is effected by passing the current through the materials to be welded, which are at the same time pressed together.

The new automatic resistance welders consist of a frame-work for holding the work, a transformer for supplying current to the electrodes, movable electrode wheels and the necessary control apparatus. These equipments were designed particularly for welding the seams of light metal containers and are suitable only for making lap joints with relatively thin metal. The welding speed varies from 20 to 100 in. p.m., depending on the thickness and nature of the material. The total thickness of the material must not exceed ¼ in.

John Warren Watson Co. Buys Additional Plant

PHILADELPHIA, Mar. 1—In order to take care of its rapidly expanding business, the John Warren Watson Co. has secured additional manufacturing space at 23rd and Chestnut Sts. Stabilator production will commence in the new quarters this week and the output of this plant will be devoted exclusively to original passenger car equipment business.

In the future, the present factory at 24th and Locust Sts. will concentrate on the production of stabilators to meet the demands of the company's distributor and dealer organization. Executive offices of the company will remain at this office.

Production is being maintained at a high level, the one millionth stabilator having been turned out on Feb. 1. In 1925, the company sold approximately 4½ times as many units as in 1924. At the present time, stabilators are factory equipment on Cadillac, Chrysler sixes, Duesenberg, Franklin, Isotta Fraschini eight-in-line, Jordan great line eight, McFarlan single valve six and eight-in-line, Peerless eight, Stutz and Willys-Knight six.

Rolls-Royce Earns $14.83 Per Share

SPRINGFIELD, MASS., Mar. 1—The annual report of the Rolls-Royce of America, Inc., shows net profit of $604,-169 for the year ended Dec. 31, 1925, after all charges for interest, taxes and expenses. This is equal to $14.83 a share earned on the 35,000 shares of 7 per cent preferred stock outstanding, on which cumulative dividends have been due since 1921. Current assets are $3,460,446 and current liabilities, $921,760.

In 1924, net profit was $15,300, before taxes, equal to 43 cents a share on the preferred.

Wico Electric Magneto for Trucks and Tractors

SPRINGFIELD, MASS., Mar. 1—Wico Electric Co. is about to put in production a new magneto for 4-cylinder motors. Its chief market demand will probably come from trucks and tractors. It is also adapted to the requirements of farm machinery. The concern will continue to make the magnetos for 1-cylinder and 2-cylinder motors.

As the factory is being operated at capacity with the present lines, the building of an additional unit to supplement the present building is projected for the near future. The output of magnetos by this concern showed a large gain last year, in both domestic and export sales, and a good production is being maintained in motorcycle batteries.

Studebaker Enjoys Second Biggest Year

Net Sales Are $161,362,944.97 in 1925, an Increase of 19.2% Over 1924

NEW YORK, Mar. 2—Net sales of $161,362,944.97, an increase of 19.2 per cent over 1924, are shown in the annual report for 1925, made public today by the Studebaker Corp. The report covers the Studebaker Corp. of America and the Studebaker Corp. of Canada, Ltd., as subsidiaries. Net income, after increased depreciation reserves, but before taxes, was $19,029,242.95, or 20.8 per cent more than the previous year, and net profits, after tax reserves, were $16,619,522.95, an increase of 20.7 per cent.

Last year was the second largest in sales and profits in the history of the company. In 1923, the high Studebaker year, net sales were $166,153,688.28, and net profits $18,342,222.95.

Common Now on $5 Basis

Total number of cars sold in 1925 was 134,664, or 24,424 more than in 1924. Cost of manufacturing, including reserve for depreciation, selling and general expense, increased from $120,017,462.95 to $142,825,182.14.

Net profits were at the rate of 10.3 per cent per dollar of sales as compared with 10.2 the previous year; and $8.55 per share on 1,875,000 common outstanding. Common is now on a $5 basis and $5.25 was paid on it last year. This, with the 7 per cent paid on preferred, made $10,423,087 total dividend disbursements for the year.

Export business increased 64.1 per cent. A total of $3,000,000 was set aside as reserve for future contingencies.

Plant Facilities Expanded

Plant facilities now make possible an output of 200,000 cars per year. Gross expenditures for plant expansions and improvements during the 7-year post-war period totaled $52,099,755, or 77.2 per cent of total gross plant investment, with $7,262,421 deducted for depreciation during this period.

Net current assets as of Dec. 31, 1925, were $52,152,131, and net current liabilities, $12,819,858, compared with $49,399,055 and $15,672,731 at the end of 1924. Surplus account was $33,409,038, compared with $30,312,603, and cash, $11,635,695, compared with $5,138,048.

New Powder Catapult for Amphibians Successful

WASHINGTON, Mar. 1—A Loening amphibian airplane, similar to those employed in the air services, has been successfully shot into the air from a catapult placed on a barge anchored in the Potomac River. This is the first attempt to launch an amphibian-type airplane by means of a catapult, and the result of the test is said to be highly important in the future development of this type of plane.

Instead of the customary compressed air which has been used in this country for a number of years in operating airplane catapults, the Loening machine was given the initial starting force from a discharge of a 3-in. blank shell. Details of the new powder catapult have been secretly developed by the United States, and both this method and the compressed air type is far ahead of the catapults used by European nations.

DODGE'S FEBRUARY DELIVERIES 18,516

DETROIT, Mar. 3—Dodge Bros., Inc., dealers in the United States in February delivered at retail 18,516 passenger cars and commercial vehicles. This is a new mark for delivery in winter months, and is 4031 better than for January of this year.

Deliveries between Jan. 2 and the end of February, 1926, amounted to 33,459 vehicles, as compared with 23,410 in the corresponding period last year.

Signed, unfilled orders for future deliveries for new cars taken by dealers in the week ended Feb. 27 amounted to 6305, a gain of 145 per cent over the previous week.

Factory shipments in February surpassed those for any previous month in Dodge history, in spite of the fact that February is the shortest month of the year.

Fisk Rubber to Pay Off Back Dividends

NEW YORK, Mar. 2—The Fisk Rubber Co. yesterday announced the extension to Mar. 14 of the time in which holders of the first preferred stock might participate in the plan for paying off accumulated dividends. More than 124,000 shares have been deposited out of a total of 185,209.

Under the plan suggested, the 26 per cent accumulated on the 7 per cent first preferred stock will be paid, $1 in cash and $25 par value (one-quarter share) of 7 per cent first preferred convertible stock, a new issue which has just been listed and is selling currently at $106 a share. It is convertible into common, four shares for one, this privilege running into 1935.

The 7 per cent preferred stock, stamped to indicate payment of back dividends, is selling to yield approximately 8½ per cent. Earnings available for preferred dividends in the fiscal year ended Oct. 31, 1925, amounted to $6,108,905, equal to more than $26 a share on the 231,512 shares of first preferred and convertible first preferred shares which will be outstanding on completion of the back-dividend payment.

Employment Stays at Record Levels

Detroit and Toledo Report Large Gains Over Last Year's Figures

DETROIT, Mar. 4—Employment in the Detroit district reached a new high mark in the week ended Feb. 27 with a total of 270,395. Of this number, 190,000 are employed in automobile or accessory plants, making this the largest number of automotive workers ever employed here in any single week. The figure is 61,120 more than in the corresponding week last year, and is 1609 more than in the previous record week, which was the third week of November, 1925.

Toledo, Ohio, employment shows a total of 26,362 employed in the week ended Feb. 27, according to reports from 51 plants, as compared with 23,757 in the corresponding period last year, and a decrease of about 50 from the week ended Feb. 20, 1926, so that working forces remain at about their high point, in spite of a slight lull in the automotive plants there.

Timken-Detroit Has $1,382,065.37 Profits

DETROIT, Mar. 3—The Timken-Detroit Axle Co. showed a net profit of $1,382,065.37 for the year ended Dec. 31, 1925, according to the company's annual report. This figure is after allowance for depreciation and Federal taxes.

Net profits, after providing for dividends on $4,307,100 of 7 per cent cumulative preferred stock outstanding, were equal to slightly more than 13 per cent on the 823,920 shares of outstanding $10 par common. The company closed 1924 with a net loss of $203,320, after charging off extraordinary items in connection with its plans for centralizing operations in its Clark Ave. plant.

Current assets, including $1,251,751.71 cash and $1,019,868.16 in demand certificates of deposit with accrued interest, amounted to $7,835,306.22. Current liabilities were $1,079,258.03, indicating net working capital of $6,756,048.19, as compared with $5,462,872 at the end of 1924.

The report shows the company has no funded indebtedness and no contingent liabilities as of Dec. 31, 1925. Dividends amounting to $305,282.83 were paid during the year on the outstanding preferred stock, and $172,600 par value of preferred stock was purchased and retired.

Haynes is Endorsed

DETROIT, Mar. 2—Frederick J. Haynes, president of Dodge Bros., Inc., has been endorsed as a director of the United States Chamber of Commerce by the Muskegon Chamber of Commerce.

Exports, Imports and Reimports of the Automotive Industry for January, 1926 and Total for Seven Months Ended January, 1926

	Month of January				Seven Months Ended January			
	1925		1926		1925		1926	
	Number	Value	Number	Value	Number	Value	Number	Value
EXPORTS								
Automobiles and parts (total)	.....	$19,021,395	.....	$26,010,256	.....	$116,975,002	.....	$188,541,703
Electric trucks and passenger cars	15	22,213	3	6,678	87	117,408	58	90,964
Motor trucks and buses, except electric:								
Up to 1 ton	.....	.....	.....	.....	9,403	3,847,905	.....	.....
Over 1 and up to 2½ tons	532	643,924	888	1,248,994	3,139	4,233,815	6,867	8,612,606
Over 2½ tons	115	362,544	196	588,397	886	2,286,947	1,137	3,535,293
Total motor trucks and buses, except electric	2,985	1,887,371	5,141	3,730,860	15,766	11,249,570	40,472	25,841,694
PASSENGER CARS								
Passenger cars, except electric:								
Value up to $500, inclusive	5,461	2,035,797	11,222	4,099,245	33,656	12,311,509	67,690	25,417,429
Value over $500 and up to $800	3,731	2,578,921	4,177	3,027,904	22,070	15,556,374	33,609	23,953,549
Value over $800 and up to $2,000	.....	.....	.....	.....	22,761	26,749,809	.....	.....
Value over $800 and up to $1,200	3,658	3,891,706	4,578	4,834,638	3,658	3,891,706	35,080	36,961,000
Value over $1,200 and up to $2,000	1,426	2,128,234	868	1,311,715	1,426	2,128,234	8,133	12,251,095
Value over $2,000	221	607,258	326	881,690	2,013	5,672,613	2,795	7,664,590
Total passenger cars, except electric	14,497	11,241,916	21,171	14,155,192	85,584	66,310,245	147,307	106,247,663
PARTS, ETC.								
Parts, except engines and tires (Lbs.):								
Automobile unit assemblies (Lbs.)	.....	2,457,077	.....	3,483,418	.....	18,302,060	.....	22,875,994
Automobile parts for replacement (Lbs.)	.....	1,520,030	.....	2,530,777	.....	12,037,466	.....	18,027,368
Accessories (Lbs.)	.....	583,778	.....	789,339	.....	3,745,414	.....	5,262,937
Automobile service appliances (n.e.s.) (Lbs.)	.....	237,917	.....	357,709	.....	1,986,001	.....	3,610,004
Station and warehouse motor trucks (No.)	10	4,223	13	7,983	92	47,632	71	65,758
Trailers (No.)	48	24,889	164	37,042	394	132,501	506	197,018
Airplanes (No.)	1	5,000	2	14,188	18	148,661	29	305,175
Parts of airplanes, except engines and tires (Lbs.)	.....	13,792	.....	25,558	.....	51,941	.....	45,540
BICYCLES, ETC.								
Bicycles and tricycles (No.)	516	14,592	385	11,156	4,279	105,688	4,153	116,987
Motorcycles (No.)	2,067	464,510	2,224	485,911	9,202	2,100,363	12,673	2,750,606
Parts, except tires (Lbs.)	.....	180,336	.....	158,083	.....	870,266	.....	958,266
INTERNAL COMBUSTION ENGINES								
Stationary and portable:								
Diesel and Semi-Diesel (No.)	113	37,405	98	125,727	641	258,461	1,129	717,539
Other stationary and portable:								
Not over 10 H.P.	2,104	189,553	1,800	175,942	17,066	1,665,446	17,353	1,509,196
Over 10 H.P.	128	172,475	262	221,010	1,250	993,877	1,834	1,500,065
Automobile engines for:								
Motor trucks and buses	7,472	562,228	674	69,118	10,750	886,068	10,836	988,652
Passenger cars	4,662	508,865	9,176	886,665	18,430	2,340,770	51,182	5,596,427
Tractors	31	7,947	25	17,208	2,044	636,857	1,180	481,764
Aircraft	5	4,277	9	17,145	39	60,930	58	128,351
Accessories and parts (Lbs.)	.....	287,745	.....	270,458	.....	1,818,426	.....	2,285,308
IMPORTS								
Automobile and chassis (dutiable)	26	67,648	83	83,100	316	462,021	489	622,093
Other vehicles and parts for them (dutiable)	.....	57,927	.....	1,387	.....	379,390	.....	451,410
REIMPORTS								
Automobiles (free from duty)	26	41,419	13	30,903	388	571,346	117	187,966

Pontiac Production Reaches 450 a Day

PONTIAC, MICH., Mar. 2—Demand for the Pontiac six since its introduction has caused production at the Oakland plant here to be increased to between 439 and 450 cars a day, President and General Manager A. R. Glancy of the Oakland Motor Car Co. has announced.

March production of Oakland and Pontiac is scheduled to be 450 a day with April averaging 500 daily. The February and March production is a 300 per cent increase over that of a year ago.

The enlarged facilities at the Fisher Body plant here are being devoted to producing bodies for both the Oakland and Pontiac lines. The increased output is the principal reason why the number of employees has been increased at the Oakland and Fisher plants.

French Car and Truck Exports and Imports Up

PARIS, Feb. 17 (*by mail*)—French automobile exports during 1925 totaled 56,689 passenger cars and 4782 trucks and tractors, of a total value of 2,108,823,000 francs, this representing a numerical increase of 30 per cent compared with the previous year. Great Britain received 12,864 passenger cars, the others in order of importance being Belgium-Luxemburg, 8160; Spain, 8113; Algeria, 5926; Switzerland, 2910; and Germany, 2713.

Automobile imports into France totaled 16,213, of a total value of 159,081,000 francs, being an increase of 14 per cent. The United States had the greater portion of this business, with 14,847 passenger cars; Italy followed with 999; England, 129; and Switzerland, 25.

Austria Plans Traffic Safety Show for May

VIENNA, Feb. 15 (*by mail*)—The Austrian Automobile Association is arranging an exhibition of the means and measures used or planned in various parts of the world looking to increased safety in street and highway traffic, to be held in the City Hall of this city in May, 1926.

The exhibition will last two weeks and the program will follow closely the program of the National Conference on Street and Highway Safety, held in Washington, Dec. 18 last.

Different sections of the exhibition will be devoted to statistics; traffic control; streets, highways and equipment; city planning; insurance; education; automomile engineering; first aid service, and literature. There will be a number of lectures during the two-week period. Shipments of exhibits should be made not later than Mar. 15 to Schenkers, Inc., 8-10 Bridge St., New York City.

Paige-Detroit to Increase Output

DETROIT, Mar. 1—The Paige-Detroit Motor Car Co. output for the first six months of the year will total 45,024 cars, it was announced at the factory today. This will be divided into 20,934 Jewetts and 24,090 Paiges. This is more than the combined output for both models last year.

March production calls for 5,000 Paiges, compared with 2,000 built in February. Jewett output is also ahead of former figures, it was said.

New Disston Machine Knife Factory Added

CINCINNATI, Mar. 2—A modern machine knife manufacturing department has been added to the branch factory of Henry Disston & Sons, Inc. This branch factory will serve users of Disston machine knives in the Middle West and parts of the South as it is now serving users of Disston saws in these territories.

Complete modern hardening and tempering equipment and machinery for grinding and beveling high-speed planer knives of all sizes have been installed. The steel for these knives will be supplied from the Philadelphia plant, where the Disston steel mills are located.

Rubber Companies Prospered in 1925

Ajax, Miller and Norwalk Reports Reflect Excellent Business Last Year

NEW YORK, Mar. 4—Annual reports of rubber companies continue to show the prosperity enjoyed in 1925.

Ajax Rubber Co., Inc., and subsidiaries report for 1925 net profit of $1,005,069, or $2.01 per share on 500,000 no par shares, comparing with $664,128, or $1.56 on 425,000 shares, in 1924. Total income was $1,764,566, compared with $1,284,286 in 1924. Cash on hand Dec. 31, 1925, was $751,794, compared with $482,520 on Dec. 31, 1924. Current assets Dec. 31 were $7,863,897, and current liabilities, $1,364,375.

Increase General Reserve

President Jacob Pfeiffer of the Miller Rubber Co. reports for 1925 net profit of $2,672,632, or $6.74 per no par common share. To increase reserve for general contingencies to $1,500,000, the sum of $860.568 was set aside.

After paying $542,591 preferred dividends and deducting $364,053 for common dividends paid or declared, and after minor adjustments of $3449 in connection with premium on retiring the preferred, the remaining surplus as of Dec. 31, 1925, was $3,879,561. Current assets were $17,888,419 including $1,280,088 cash and were five times the current liabilities.

During the year $4,000,000 par preferred were sold and the proceeds have been reflected in working capital. Mr. Pfeiffer says it was considered wise to do this "because of the substantial increase in sales and the general market conditions reflected in the much higher cost of crude rubber."

For the quarter ended Dec. 31, 1925, Norwalk Tire & Rubber Co. reports net income of $95,422, or 50 cents a common share, comparing with $108,125, or 59 cents, in the preceding quarter. Net income for 1925 was $413,429, or $2.22 a share.

C. G. Spring Buys Plant

DETROIT, Mar. 4—President Christian Girl announces that the C. G. Spring & Bumper Co. has purchased the plant in which it is now located from F. L. Bromley Properties, Inc., for $700,000. The plant, previously leased by the concern, is located at 2642-2672 E. Grand Boulevard here.

The plant is being remodeled and enlarged to double capacity with a daylight minimum production of 4000 bumpers daily. Building operations will be completed Mar. 10.

Stevens-Duryea Plant Sold

CHICOPEE FALLS, MASS., Mar. 4—The land and buildings formerly owned by Stevens-Duryea Motors, Inc., and sold two years ago to the Springfield Body Corp., have been sold at auction to Richard B. Aldcrofft of New York, for $250,000, under foreclosure of a mortgage running to the Gotham National Bank. Thirty-five acres of land as well as certain water rights were included in the transaction.

The plant never was operated by the Springfield Body Corp., and that concern's plant in West Springfield, where bodies formerly were manufactured, has been closed down for some months.

Hupp Corp. Plans Big March Output

DETROIT, Mar. 1—March is expected to be the best month in the history of the Hupp Motor Car Corp., O. C. Hutchinson, sales manager, says. Plant arrangements are now nearing completion, he says, which will permit increased output.

Sales for this year, according to Mr. Hutchinson, indicate that the Hupp output will be at least 50 per cent more than in 1925.

India Tire & Rubber May Declare Stock Dividend

AKRON, Mar. 1—A stock dividend of five shares for one is to be declared soon by The India Tire & Rubber Co., according to reliable reports. The present common stock of $100 par value will be replaced by five shares of no par value.

There are outstanding 11,000 shares of the $100 common and $256,000 in 7 per cent preferred. There are no bonds or other funded debt.

The $100 common has been earning 8 per cent, but it is said the new stock will have a greater dividend rate. The earnings, after all charges and reserves, equalled $40.74 a share.

The India Tire & Rubber Co. has just completed a new addition to its plant and will increase the production facilities considerably.

Liquidation of Rollin Approaches Completion

CLEVELAND, Mar. 4—The sale of the Rollin Motors Co.'s assets realized approximately $47,500, subject to expenses of the sale. The company had also about $255,000 of cash accumulated during the operation of the creditors' committee from June 10, 1925, to Dec. 9, 1925.

Claims presently liquidated were in the neighborhood of $1,000,000, and it was hoped, according to a statement from the committee, that the unliquidated claims would not exceed $200,000. The property was sold in parcels.

The repair parts business and goodwill were purchased by the Cleveland Trust Co.

Motor Wheel Income Up

NEW YORK, Mar. 1—Net income of Motor Wheel Corp. in 1925 was $2,502,027 or $4.32 a common share against $1,800,093 or $3.75 the previous year.

Financial Notes

U. S. Radiator Corp.—Net earnings of this company, for the fiscal year ended Jan. 31, 1926, after estimated Federal taxes and contingencies, amounted to $1,386,092.25. This is equivalent to $5.49 a share on the 200,000 shares of common stock of no par value. It compares with net earnings of $1,521,476.96 for the preceding year, equal to $30.84 a share on the 40,000 shares of common stock of $100 par value outstanding.

Current assets totaled $5,910,840.94, including $433,942.02 in cash, $501,789.49 in United States certificates of indebtedness and $3,394,154.15 in inventories. Current liabilities were $426,185, consisting wholly of accounts payable and accrued expenses, disclosing net working capital of $5,474,655.94 and a ratio of current assets to current liabilities of 13.9 to 1.

Borg & Beck Co.—The consolidated income account of this company for the year ended Dec. 31, 1926, shows surplus for the year of $364,724; no surplus was reported for the year 1924. Earnings per share on the capital stock of the company in 1925 were $5.17, against $2.47 in 1924. Total current assets as of Dec. 31, 1925, were $1,443,806, compared with $1,268,498 in 1924, and total current liabilities last year totaled $393,091, against $446,279 in 1924, leaving net working capital as of Dec. 31, 1925, $1,050,715, compared with $822,228 at the end of the previous year.

Auburn Automobile Co.—This company has offered to its stockholders 40,000 additional shares of common at $65 a share. The purpose of this sale is to furnish additional working capital required for expansion purposes, according to E. L. Cord, president.

The entire outstanding 8 per cent preferred stock has been called for payment at 105 and accrued dividends on Apr. 1.

White Co.—The New York Curb Market has admitted to trading privileges this company's 300,000 additional shares of $50 par common stock to be issued as a stock dividend and against subscription rights.

Fisk Rubber Co.—The New York Stock Exchange has admitted to listing this company's $18,520,900 first preferred stock, stamped, $4,630,300 first preferred convertible stock, and 85,272 additional shares of no par common stock.

Budd Wheel Co.—Directors of this company have declared an extra dividend of ¾ per cent and the regular quarterly dividend of 1¾ per cent on the 7 per cent first preferred stock, payable Mar. 31 to holders of record of Mar. 10.

Timken-Detroit Axle Co.—Directors of this company have declared a quarterly dividend of 1½ per cent on the common, payable Apr. 1 to holders of record of Mar. 20. The last previous dividend paid on the common was 2 per cent paid Jan. 15, 1921.

F. I. A. T. Co.—A cable from Milan, Italy, states that directors of this company have declared a dividend of 30 lire a share on each of the 200-lire shares. Last year a dividend of 22½ lire a share was paid.

Sherwin-Williams Co.—This company will retire $450,000 7 per cent preferred stock as of June 1, 1926. The stock will be redeemable at 105 and stockholders will be notified about May 1, it is said.

English Citroen Factory is Opened

LONDON, Feb. 18 (*by mail*)—The English plant for the production of Citroen cars for the British and colonial markets was formally opened today by M. Andre Citroen in the presence of some hundreds of pressmen and dealers.

The plant is at Slough, near Windsor (about 20 miles from London), the site being a portion of the military motor transport depot established during the war. Approximately 500,000 sq. ft. of floor space is available in two buildings, while a further 60 acres of ground has been secured for future expansion.

Capacity for 200 Chassis Weekly

As at present organized, the plant has a capacity for assembling 200 chassis a week from French components and the fitting of a corresponding number of bodies constructed on the premises; but it is intended to increase the capacity and output so as to work up to 60,000 cars in 1928. Meanwhile, machine shops are to be equipped, so that in due course the complete cars can be British-made.

The equipment so far installed is on quite modern lines, with a chain conveyor for chassis erection and compressed air drills and mechanical spanners in the assembly shops.

The opening of this plant was also the occasion of an announcement of price reductions in respect of existing models and of the introduction to this country of a 4-wheel braked 11.4 hp. model with half-elliptic, instead of quarter-elliptic, springs. The new prices represent a general reduction of 8-10 per cent, the 11-4 hp. all-steel saloon, for instance, now being £225 instead of £245. The front-braked models are £20 extra in all cases.

U. S. Produces 71.6% of World's Petroleum

NEW YORK, Mar. 1—The American Petroleum Institute estimates world petroleum production in 1925 at 1,066,-220,000 barrels compared with 1,012,927,-000 as reported by the U. S. Geological Survey for 1924, an increase of 53,293,-000 barrels or 5.2 per cent.

The United States produced 764,000,-000 barrels or 71.6 per cent of the world total against 70.5 the previous year. Mexican production fell off 24,497,000 barrels or 17.6 per cent. In 1925 the United States and Mexico produced 82.4 per cent and in the previous year 84.3 per cent of the world output.

Westinghouse Appointments

SWISSVALE, PA., Mar. 1—G. B. Cushing has been appointed assistant general sales manager for the Westinghouse Union Battery Co. G. P. Hall, for several years manufacturers sales representative, is now manager of manufacturers sales, with headquarters in General Motors Bldg., Detroit. D. W. Souser, office manager, has been appointed assistant to the vice-president and general manager.

Salvaging Proves Profitable to Ford

DETROIT, Mar. 1—The Ford Motor Co. in the last year has realized more than $11,000,000 in savings by salvaging scrap wood, furnace slag and other by-products coincident with the manufacture of automobiles. Of the $11,000,000 upwards of $4,000,000 was realized from scrap heaps and waste.

Chemicals which brought in a return of $1,939,776 lead the list of what otherwise would have been waste material. Scrap wood, from the Iron Mountain plant and distillation plant and coal from the River Rouge cooking ovens were high in reclamation productivity. Among other things, cement was produced from blast furnace slag and various scrap materials.

Related Industries Also Contribute

Surplus materials from some of the related industries under Ford control, such as coal, iron, ore, timber, glass, steel and other items also showed profits. They are manufactured in order to keep production of the various plants up to capacity, and the surplus production is sold for a profit.

A total of $2,719,881 profit was realized from sales in the open market of surplus coal from Ford-owned mines, and other financial assets were realized in sales of certain sizes of glass. Farm products and livestock, from the experimental farm adjoining the wheel factory at Hamilton, Ohio, also found a market.

Developments of the Week in Leading Motor Stocks

NEW YORK, Mar. 4—The sweeping decline in prices on the New York Stock Exchange during the week raised the question in the minds of many outside of Wall Street as to whether or not some drastic change in fundamentals had occurred which might presage an early termination of the prosperity which the country has experienced. Let it be said at once that no such change has occurred.

The chaotic conditions which prevailed were the direct result of the preposterous speculation for the rise which ran wild throughout the fall and winter. Prices of many stocks were carried to levels which discounted all of a favorable nature that could possibly eventuate, and public interest finally was continued on the theory that the simple expedient of buying by sheer strength of resources would result in carrying prices to higher and ever higher levels.

The decline of the week appeared to experienced observers as the natural outcome of such an unnatural speculation. If there has been some disappointment in the financial district at the slowing down of business since the first of the year, then the previous hopes for a continuance of activity on the scale of last October to December were ill-founded. For certainly such a slackening of activity is usual after the holiday buying. But current trade returns are in excess of the figures of last year.

The crash in such specialties as Foundation Co., New York Canners and American Brake Shoe Co. brought demoralization to the general list but announcement that the unlucky "pools" in these stocks had been taken over by banking groups served to steady the market somewhat. That banking support finally has been accorded probably means that the worst is over.

Motor Stocks Not Unduly Affected

The action of the motor stocks during this period has been a remarkable demonstration of the faith of leaders of the industry in the immediate future and of the confidence of the general public. They have declined, it is true, but at no time has there been any demoralization, and at no time has there been any really serious situation in them. The nearest to an uncontrolled market was the offering of a large block of Stewart-Warner on Tuesday which resulted in a perpendicular drop of five points between sales, but this was recovered partially before the close.

The spectacular declines registered Wednesday affected all the motor shares to some extent, but again strong support was evidenced in quick recoveries from the low points of the day, so that Hudson, which at one time showed a total loss of more than 14 points, closed with a net decline of only 5½ points. On the whole, the group came out of the period of liquidation with much smaller losses than any other industrial group.

In such markets there is little need for more than generalities. The whole market is affected by the same underlying causes and the good stocks decline with the bad. But the motor stocks certainly recall, by their action, the amazing rally which occurred in this group in the spring of 1921, when, out of an utterly demoralized general market, they soared from 25 to 75 or more points.

Money, while somewhat firmer, has not been unduly difficult to obtain, the 5½ per cent rate which was reached in the closing days of last week reflecting only the end of the month operations by the banks. Income tax payments and Government financing are likely to make for an unsettled money market until after the middle of this month, but bankers anticipate no drastic curtailment of funds.—H. H. S.

Dodge's Earnings Set High Record

Net Income $28,698,846 in 1925—Sales Totaled $216,841,368

NEW YORK, Mar. 2—Record earnings for Dodge Bros., Inc., are shown in the annual report for 1925. Net sales were $216,841,368, against $191,652,446 in 1924, the company's previous record year. Net income, after depreciation, but before interest on funded debt and Federal taxes, was $28,698,846, against $19,965,440 in 1924. The figures for 1925 include earnings of Graham Bros. subsequent to the acquisition in October.

Graham earnings, after all charges except Federal taxes, for all 1925, were $4,966,236.

Common Earns $6.59 a Share

The Dodge net of $28,698,846 is equal, after taxes, full year's interest on debentures, and dividend requirements on preference stock outstanding Dec. 31, to $6.59 a share on the Class A and Class B common stock. The earnings given are after charging off $3,700,000 refunded to dealers to protect them against losses on the two price reductions made during the year.

Vehicles sold total 255,322 in 1925, against 222,236 in 1924.

Cash $27,171,042 on Hand

Cash in banks and Government and other marketable securities as of Dec. 31, 1925, totaled $27,176,042. Current assets were $51,092,613 against current liabilities, including accrued dividend on preference stock, of $16,197,705.

The joint report of Frederick J. Haynes, president, and Edward G. Wilmer, chairman of the board, shows that during the year $15,002,000 principal amount of debentures were converted into 434,563 shares of common stock Class A, and $513,000 principal amount of debentures were retired through the regular operation of the sinking fund. Thus debentures were reduced from $75,000,000 to $59,485,000, and issued and outstanding Class A common increased from 1,500,000 to 1,934,563 shares.

Motor Companies Protest N. Y. Ship Canal Bill

ALBANY, N. Y., Mar. 1—The Ford Motor Co. at Green Island and other automotive firms have filed official protest against a bill now in the State Legislature which would eliminate this section from the proposed All-American Ship Canal extending from Buffalo to New York.

That the Ford Co. is planning extensive use of the barge canal next summer is indicated by an announcement that a fleet of barges will be shortly in operation connecting the Green Island and New Jersey plants with the main plant at Detroit.

CAR TIME-SELLING TWO-THIRDS TOTAL

NEW YORK, Mar. 2—Automobile time sales in 1924 were two-thirds the total, in dollars, of all instalment sales, according to figures reported by James H. Perkins, president, Farmers Loan & Trust Co., as part of a survey which quoted opinions on instalment buying and selling by many industrial leaders. The totals given for products sold on time payments in 1924 show that automobiles amounted to $2,182,561,878 out of a grand total of $3,293,411,878 for all products.

A. R. Erskine, president, Studebaker Corp., in expressing approval of time-selling, said that criticisms of the plan came largely from industries whose products were not marketed under the plan. Alfred H. Swayne, vice-president, General Motors Corp., said that instalment buying was proceeding in the main along sound lines and was a healthy development insofar as it conformed to good credit standards.

Nash and Ajax Set New Output Record

KENOSHA, WIS., Mar. 4—The Nash Motors Co. through E. H. McCarty, general sales manager, announces that production of Nash cars in February marked the high-water mark for the company to date. Production of the Nash-built Ajax Six also reached a new high record in the shortest month of the year.

Total output of the Nash-Ajax plants in February was 14,148, thus outstripping its previous record month, August, 1925, by a margin of several hundred cars. Mr. McCarty also pointed out that February was the eighteenth consecutive month in which Nash sales have surpassed the record set by the corresponding months of the previous year, with the exception of November, 1925, when production was halted purposely to bring the new "enclosed car" motor into manufacture.

Mr. McCarty stated that among the large number of cities having unfilled retail orders were Chicago, 708; New York, 601; Boston, 281; Philadelphia, 187; Cleveland, 156; and Detroit, 134.

Merriman a Hayes Director

DETROIT, Mar. 2—Mark Merriman has assumed the duties of director of sales of the Hayes Wheel Co., of which he is vice-president, while W. S. P. Williams, former manager of sales and service, becomes general sales manager. Fred E. Castle, formerly associated with Mr. Merriman, has taken the position of Detroit representative, with offices in the General Motors Building.

Truck Industries, Inc. in Detroit Meeting

Younger, in Address, Commends Standardization Program

DETROIT, Mar. 3—With over 70 members in attendance, Motor Truck Industries, Inc., met today at the plant of the Timken-Detroit Axle Co. John Younger, professor of industrial engineering, Ohio State University, endorsed the standardization program of the association, and coined the term "boundary" standardization to indicate the use of standard units without destroying the flexibility of individual units.

He declared that the automotive industry is not taking sufficient pains to train good men and cited the work of other industries in moulding courses at universities.

Master Committee Appointed

A report on association activities for the year showed that the membership had reached 82. A master committee was appointed taking the place of the ratings committee and designed to be the clearing house for all work done. On it are C. D. McKim, Continental Motors Corp.; E. B. Ross, Clark Equipment Co.; Ed. A. Ross, Ross Gear & Tool Co.; Col. Fred Glover, Timken-Detroit Axle Co.; Gould Allen and A. E. Parsons of Brown-Lipe Gear Co.; R. E. Carpenter, Spicer Mfg. Corp.; R. E. Hayslett, Hydraulic Pressed Steel Co.; William Morrison, Highland Body Co., and G. A. Wilbur, United Motors Products Co.

Cooperation of Plane and Engine Makers Urged

DETROIT, Mar. 1—Lieut. Cyrus Bettis, winner of the 1925 Pulitzer Cup race, speaking before the Detroit S. A. E. at a meeting last week, stated that closer inspection of the numerous oil and fuel controls and other connections between the plane and the engine proper is needed to reduce the number of forced airplane landings caused by engine failure. He added that a large proportion of forced landings are not caused by the structural failure of the engine itself, but by one of the connections giving trouble through lack of proper maintenance.

In his paper, entitled "Aircraft Engine Operation and Maintenance," presented before 150 members and guests of the Detroit S. A. E., Lieut. Bettis stressed the necessity of greater cooperation between engine and airplane manufacturers, and established a few of the important requirements for engineers to follow in designing the engine and plane.

A letter from Arthur Nutt, chief engineer of the Curtiss Aeroplane & Motor Co., read at the meeting, in addition to endorsing the views of Lieut. Bettis, urged the necessity for standardization of aero engine accessories.

S.A.E. Plans March and April Meetings

Dates, Subjects to be Discussed, and Gathering Places Are Announced

NEW YORK, Mar. 1—The Society of Automotive Engineers has just announced the dates of its March and April sectional meetings and the subjects to be discussed.

The Pennsylvania Section will meet in Philadelphia Mar. 9, at which time Col. R. O. Mason and T. O. Day will speak on "Fleet Management"; the Dayton, Ohio, Section will hold its March meeting on the 10th, when F. C. Mock will present a paper on "Spring Suspension and Riding Qualities"; two meetings take place Mar. 11, one at Detroit, addressed by S. W. Sparrow on "Engine Design and Anti-Knock Fuels", and the other at Indianapolis, when A. J. Scaife will read a paper on "Bus Transportation"; a meeting at Los Angeles on Mar. 12 will hear E. Favary on "Mathematical Analysis of Brake Requirements" and John Wiggers on "Brakes and Brake Development."

Kettering to Speak on "Research"

The Cleveland Section convenes Mar. 15 to listen to C. F. Kettering on the subject of "Research"; on Mar. 16 the Buffalo Section will hear a paper on "Studies on the Oscillation of Leaf Springs" by N. E. Hendrickson. Detroit will meet for the second time in a month on Mar. 25 to listen to a discussion of "Automobile Gearing" by John Bethune, and on Mar. 26 the Chicago S. A. E. will hear F. E. Moskovics on "Development and Trend in Industry", H. L. Horning on "Progress in Engine and Chassis Design" and R. E. Wilson on "A Suggested Remedy for Crankcase Oil Dilution."

The April meetings open on Apr. 7 at Milwaukee, when that section will be addressed by Fred Gleason on "Chassis Lubrication." The following day the Detroit Section will hear C. F. Kettering on a subject yet unannounced and the remainder of the meetings for that month, for which speakers and subjects have not yet been made known, will take place Apr. 8 at Indianapolis, Apr. 19 at Cleveland and Apr. 22 at Detroit.

Michelin's English Plant

LONDON, Feb. 18 (*by mail*)—It is stated on behalf of the Michelin Tyre Co. that, on the site secured at Stoke-on-Trent, in the English Midlands, a plant is to be erected and equipped at a cost of £500,000. The site is known as the Old Racecourse, and is nearly 200 acres in extent. Tire production there is expected to commence in a little more than twelve months, and, when the plant is completed, it is hoped to employ from 8000 to 10,000 workpeople, 25 per cent of whom will be women. Except for a few pivotal men, the labor will all be unskilled, and of this class there is an ample supply in the district.

Local authorities have promised to erect houses for the company's workpeople, to supply current for lighting and power at low rates, and to link up the plant with the London, Midland & Scottish Railway.

U. S. CARS SUPPLANT GERMAN AT LEIPSIC

LEIPSIC, GERMANY, Mar. 1—The American automobile industry is prominently represented at the Spring Samples Fair, which opened here today. Almost every well-known make of American car is being shown in the great technical hall, and not a single German one.

The explanation of this situation is that domestic manufacturers have boycotted the fair in favor of the Berlin show, which they deem better for their business.

It is reported that the striking exhibition of American cars, coupled with the complete absence of German makers, has produced a great effect on the 27,000 visitors who attended the opening of the fair.

Larger Sunbeam "8" Now in Production

LONDON, Feb. 16 (*by mail*)—The straight-eight Sunbeam, introduced at the Olympia Show in October last, was offered with two lengths of wheelbase (137 in. and 147 in.), the engine of both types having a bore and stroke of 80 x 120 mm. (294 cu. in.). It is announced today, however, that the engine bore of the longer type will be increased to 85 mm., making the piston displacement 332 cu. in. The additional power thus secured is considered desirable in view of the fitting of large closed bodies to the chassis; it will make the road performance of all complete cars of this model approximately equal.

The price of the long-wheelbase chassis is £1250, and that of the short one £1050.

Reed Gets Collier Trophy

WASHINGTON, Mar. 1—The Collier Trophy, awarded annually for the greatest achievement in aviation in the United States, has been presented to Dr. S. Albert Reed of New York for development of the Reed metal propeller.

The National Aeronautic Association's trophy committee, in announcing the 1925 award, declared that Dr. Reed has spent the last four years in the development of the propeller, especially designed for high-speed engines used in Army and Navy pursuit airplanes, and 1925 marked the general adoption of this type of propeller for all high-speed airplanes used in this country.

January Automotive Collections Increase

Gain of $2,623,753.39 Over Corresponding Month of Last Year

WASHINGTON, Mar. 4—Internal Revenue Bureau collections from the automotive industry during January, 1926, totaled $11,471,066.85, or $2,623,753.39 more than for January, 1925, when the total collections were $8,847,313.46, it is announced here at the Treasury Department.

An increase of $21,367,716.64 is noted in the collections from the industry for the period from July 1, 1925, to Jan. 31, 1926, over the period from July 1, 1924, to Jan. 31, 1925. The total for the later period is given at $90,576,885.77 as against $69,209,169.13 for the earlier period.

Collections as Segregated

Segregation of the collections from the automotive industry shows that during January, 1926, automobile trucks and automobile wagons paid $542,672.17, as compared with $591,796.38 in January, 1925; other automobiles and motorcycles during January, 1926, paid $9,402,816.82, as compared with $6,598,539.66 during January, 1925, and automobile parts and accessories during January, 1926, paid $1,525,577.86, as compared with $1,656,977.42 during January, 1925.

Aggregate receipts of the Internal Revenue Bureau from all sources during January, 1926, is given at $100,824,113.73 or $673,255.66 more than for the same month in 1925, when the total was $100,150,858.07.

Wingquist Invents an Automatic Transmission

GOTHENBURG, SWEDEN, Feb. 15 (*by mail*)—Dr. Sven G. Wingquist, chief engineer and founder of the S. K. F. company, has invented an automatic transmission and recently had one of these installed on a closed car of American make. It is stated that the device varies the transmission ratio automatically with the load, thus leaving the driver free to devote his attention to the throttle and brakes. From patents which have been issued to Dr. Wingquist in recent years it is presumed that the shift makes use of both mechanical and hydraulic principles.

In a somewhat vague description of the device it is stated that "more and more wheels are thrown into gear as the resistance increases, and gradually cut out as it decreases," from which it would appear that the drive is of that particular hydraulic type which makes use of a motor having a number of chambers, each with its own rotor, and of control mechanism so arranged that the water can be either passed all through one chamber or divided among several of them.

Men of the Industry and What They Are Doing

Standard Forgings Corp. Elects Directors, Officers

The Standard Forgings Corp. of Delaware at a recent meeting elected the following as directors and general officers of the three companies, in charge of operating the three companies' plants: C. R. Lewis, vice-president and general manager of sales; L. C. Ryan, vice-president and treasurer; A. C. Stockton, vice-president and secretary; G. E. Van Hagen, president and general manager.

The recently acquired Pollak Steel Co. plant at South Chicago, Ill., will be operated under the name of Standard Forgings Co., South Chicago plant. The plant at Indiana Harbor, Ind., will continue under the name of Standard Forgings Co., and the plant at East St. Louis, Ill., will continue under the name of St. Louis Forgings Co. All of these companies are to be under the jurisdiction of the general officers mentioned above.

Van Cleef Commissioned Major

Paul Van Cleef, executive in charge of production of Van Cleef Bros., Chicago, manufacturer of rubber and chemical products for the automotive and electrical trade, has just been commissioned a major in the Officers Reserve Corps of the Chemical Warfare Service.

Major Van Cleef has been very active in the Chicago affairs of the American Chemical Society, a committee from which society, composed of eminent chemists, recommended the new major for his appointment.

Wilson Re-elected President

Officers of the E. H. Wilson Mfg. Co., Moline, Ill., maker of automobile bodies, were re-elected at the annual meeting last week as follows: E. H. Wilson, president and treasurer; W. L. Mueller, vice-president, and A. C. Vinton, secretary. The company this week closed a $1,000,000 contract with a car manufacturer to supply it with bodies.

The company has also gone into the radio cabinet field and has booked several line contracts.

Buckeye Jack Officers Reelected

Officers of the Buckeye Jack Co., Alliance, Ohio, manufacturer of automobile jacks, were reelected as follows: W. H. Purcell, president; A. A. Mulac, vice-president, and J. C. Rodman, secretary and treasurer. W. H. Purcell, F. E. Dussell, F. W. Trabold, Dr. C. S. Hoover, A. A. Mulac, A. L. Atkinson, and C. J. Bates are the directors. The plant is operating near capacity.

Ferry and Campbell Promoted

S. T. Campbell has been elected president of the Aetna Rubber Co., Cleveland, Ohio, to succeed Thomas Ferry, who resigned to become chairman of the board of directors of the company.

CHRYSLER FINANCES AFRICAN EXPEDITION

Walter P. Chrysler, millionaire automobile manufacturer, was revealed in Washington this week as the sponsor of an African expedition which is to set out this summer into the wilds of Africa in one of the most pretentious hunts since the days of Theodore Roosevelt.

The expedition will be conducted by the U. S. Smithsonian Institute and financed by Mr. Chrysler, but it is considered unlikely that the automotive magnate will accompany the expedition. He is said to have declared that he hoped the institute men would find "100 species of animals never before seen in this country."

Green Home from Europe

Trends indicating the increasing use of sleeve-valve type of engine among European manufacturers of passenger and commercial cars are reported by Col. G. A. Green, vice-president in charge of engineering of the Yellow Truck & Coach Mfg. Co., Chicago, who returned recently from a two months' tour of automobile plants in England, France, Belgium, Germany and Switzerland.

During his visit he made a study of the latest European developments in engineering and design with particular reference to commercial vehicles.

Col. Green spent considerable time inspecting the plants and operations of the London General Omnibus Co., London, England, with which he was at one time associated as assistant engineer.

Dugan Re-elected President

At the annual meeting of the directors of the Shuler Axle Co., Inc., of Louisville, Ky., the following officers were elected: W. E. Dugan, president and general manager; W. H. May, vice-president; L. E. Saunders, treasurer; H. R. Silver, secretary.

Miles to Take Trip Abroad

Sam A. Miles, manager of the show department of the National Automobile Chamber of Commerce, sails for Europe Mar. 20 to join Mrs. Miles, who is now on a Mediterranean cruise. Together they will make an automobile tour of France.

Gannon is Promoted

A. P. Gannon has been promoted from field representative of the John Warren Watson Co. in the Central Atlantic States to representative for the New York and northern New Jersey territory. H. K. Mitchell will shortly take over the territory formerly covered by Mr. Gannon.

Acme Motor Truck Elects Officers and Directors

C. F. Williams was reelected president of the Acme Motor Truck Co. at the annual election held in Cadillac, Mich., recently.

All the old officers were reelected, including J. P. Wilcox, vice-president, L. C. Klesner, secretary, and Henry Knowlton, treasurer. Directors of the company are W. L. Saunders, J. C. Ford, L. J. Deming, George C. Brown, F. C. Wetmore, and F. E. Bowen.

John H. Weller of Detroit has been employed as general manager.

Ditzler Names New Officers

E. R. Hoag, president of Ditzler Color Co., Detroit, announces that Kirke W. Conner, formerly secretary and director of sales, is now secretary and director of engineering service. Lawrence Du Bey, formerly factory manager, has been elected to the board and will serve as director of research and manufacture. Neil A. Fleming has been promoted from assistant sales manager to sales and advertising manager, and Ernest Hummitch has been promoted from office manager to assistant sales and advertising manager, with L. A. Carter succeeding Mr. Hummitch as office manager.

N. A. C. C. Representatives Sail

George F. Bauer, secretary of the National Automobile Chamber of Commerce foreign trade committee, sailed for Havana on Feb. 20, and Alfred Reeves, general manager, Roy D. Chapin and John N. Willys, the latter two of whom came from Florida, sailed for Cuba a week later. These N. A. C. C. representatives have been invited to assist the Cubans in planning the expenditure of a $100,000,000 road bond issue recently authorized by the Cuban Government.

Kurtz to be Sent to Paris

L. H. Kurtz, who for several years has been director of advertising for the General Motors Export Co., has been transferred to the staff of H. G. Zimmerman, vice-president and regional director for Europe.

The regional director's office, beginning Apr. 1, will be located in Paris. Mr. Kurtz is sailing on the S. S. George Washington on Mar. 10.

McDaniel a Vice-President

Charles W. McDaniel, who for seven years has been manager of the tubes sales department of the Goodyear Tire & Rubber Co., Akron, has announced his resignation.

Mr. McDaniel will become vice-president and account executive for the Eddy & Clark, Inc., sales and advertising agency of Akron. His successor has not been selected.

February Sales Well Above Seasonal Level

(Continued from page 424)

feel that the ratio of gain could well be continued throughout February.

Easing of the used car difficulty was reported in some sections, and in others conditions were found no worse. With due appreciation of this situation, however, it seems plain that rapid disposal of used car stocks and a rigid policy affecting trade-ins are the prime merchandising needs of most of the dealers right now.

The price-cuts on closed Fords have not helped the used-car market in the low-priced field, and a good deal of readjustment seems to face dealers in these lines.

The automobile shows held during the month proved as potent a stimulus to sales as those given in January. Dealers almost everywhere are highly optimistic about the prospects for March business.

Reports for some of the more important centers entering into the survey, summarized, are as follows:

New York

General prosperity continued to be reflected in new car sales in February throughout the Metropolitan territory. Complete February figures are expected to compare favorably with January, and may go higher. In the first fortnight of February 1616 new cars were sold, less than one-fourth of the January total, but the latter included a large number of cars sold in December and not registered until January. The used car market is seasonally slow, with several special sales recently to keep the turnins moving.

Boston

Boston distributors and dealers are satisfied with the amount of business done during February. They would have welcomed more, but when two blizzards within a week's time piled up the highways, putting a ban upon demonstrations entirely, they feel they have done pretty well. It was just as serious outside Boston. However, Washington's Birthday gave an opening wedge and the men were all keyed up to high speed sales. Used cars have not been moving very well, but the holiday sales did much to decrease the number.

Philadelphia

Sales of new cars in the month just ended were large in volume, and, while it was hardly to be expected that sales would exceed those of the previous month, when the automobile show stimulated interest in cars, they were ahead of those for February last year. The used car situation showed some improvement. Some dealers declare that they are practically out of them at the moment.

Baltimore

Two things worked together during February to bring about a rather dull trading period in the Baltimore territory. Some cars were sold, of course, but the business was not up to what some had hoped. Practically all of the blame is placed upon the weather and the uncertainty of the Government tax bill, which was not settled until near the end of the month. With the passage of the new tax measure Baltimore dealers are confident that excellent business will result. In general, they have their stocks of new cars in good condition and are ready to take care of the business. An improvement in the used car situation was brought about during the month. The February demand was fair and enabled the dealers to move quite a few of these vehicles.

Atlanta

February car sales continued very active, especially in low and medium-priced cars, while sales of high-priced cars were fair. Business in country districts was unusually good, due to the generally excellent agricultural conditions. The spring outlook for new car sales is considered by most distributors as giving promise of one of their best seasons.

Cleveland

February's volume of business here in the automotive industry was everything its beneficiaries had hoped it would be. Manufacture of cars, trucks, parts and accessories maintained the pace set some time ago. Sale of cars and parts are unusually good for the season but less than the high water mark set in January. Everyone seems satisfied with the last month's volume of trade and everyone by the same token is optimistic concerning prospects for the current month and the approaching spring.

Detroit

With employment conditions in the Detroit area at, or close to, the peak, it is natural that automotive sales should be on a high level. As to production, the rapid gains made in recent months have caused some fear that there would be heavy over-stocking of the dealers unless output were drastically curtailed. On the contrary, dealers' stocks seem to be little, if any, heavier than normal while consumer demand is steady and increasing.

Chicago

Sales in February ran far ahead of the same month a year ago, the ratio of increase being even greater than in January. Spring weather has greatly aided the sale of used cars and stocks are reported as scarcely more than normal. Last month's business is estimated at about 30 per cent ahead of January and at least double those of February a year ago. No trouble is being experienced with repossessions.

Minneapolis

Increased sales over February of last year are reported in this territory. The used car business is fair to good, while the tire trade reports business as poor, as there seems to be no incentive for dealers to buy speculatively.

Denver

Automobile sales in this territory show an increase of approximately 150 per cent over 1925 business. Agricultural conditions and tax reduction on cars have served to stimulate business to a great extent. The automobile show served to improve sales throughout the territory. The western slope slowed up somewhat, but the southeastern part reported good business.

Dallas

While February automotive trade in Texas and parts of adjoining states broke no records, most lines showed a slight increase over the same month a year ago and the indications were that business would continue good. The general situation was sound and while farmers were not buying "luxuries" no "tightness" of money was being felt in the district. Automobile and tire distributors and equipment jobbers are conferring with dealers and salesmen with a view of pushing sales during the early spring months and the outlook is regarded with optimism. Dealers are slashing prices to move used cars.

Los Angeles

February new car sales showed an appreciable increase over last February, with a slight increase over January in the low-priced field. The automobile show, which opened Feb. 20, proved a great stimulus to trade. More sales were reported at this year's show than at any previous local exhibition. Used car stocks in southern California continue heavy, although a gradual reduction is taking place.

Common Carrier Car Pays $382 in Taxes

Higher Fee Required Than for Private Vehicle Because of Wider Use of Roads

NEW YORK, Mar. 2—Taxation of motor truck common carriers amounts to $382 per year per unit, the average license fee being $276.34 and the average gasoline tax cost $105.60, while the average fee of a motor truck as a private carrier is $64, according to an analysis by the Bureau of Public Roads of fees in 25 states which make extra charges on common carrier motor vehicles.

These figures as now being disseminated by the National Automobile Chamber of Commerce show that the private carrier pays a total of $169 in taxes, or less than half the taxation on the common carrier.

Reasons for Distinction

"The theory of the states," says the N. A. C. C., "in charging higher fees to the common carrier is based on two factors, one being the tax on the motor vehicle as a business having certain privileges, and the other that the common carrier trucks are likely to use the highway more extensively and hence lead to higher highway maintenance costs.

"In making this distinction, the legislators apparently have in mind two types of use of the highway. In the first place the highway is a public way and all persons and owners of private vehicles are entitled to use it as citizens. It is built for the common good to facilitate communication. The common carrier, however, uses the highway as a major part of its business equipment, uses it more than the private carrier, on the average; and, in the opinion of those forming these laws, may be reasonably charged higher fees. Common carriers are a small percentage of the total commercial vehicle operation."

The Chamber is issuing a series of bulletins dealing with this question, especially as it relates to motor transport in connection with railroad prosperity. Many of these bulletins contain reprints of newspaper editorials. These editorials in the current bulletin show that the volume of automotive freight carried by steam roads helps the rail workers, that, with motor trucks as feeders to a railroad, highway taxes hit all transport, and that rail lines can benefit from highway taxation by using motor units.

Air Races at Philadelphia

NEW YORK, Mar. 1—The National Aeronautic Association has announced that the 1926 National Air Races will be held at Philadelphia in September in connection with the Sesqui-Centennial Exposition.

Atlantic City Races

ATLANTIC CITY, Mar. 2—A new automobile speedway will open here with a program of races May 1. The project is backed by important financial interests and will be managed by Paul C. Pommer, former secretary of the contest board of the American Automobile Association.

Bus Company Seeks New York Franchise

Newly Incorporated Omnibus Corporation Would Establish Network of Lines

NEW YORK, Mar. 1—The Fifth Avenue Bus Co. and the New York Railways Co. have amalgamated and incorporated as the New York City Omnibus Corp., with John A. Ritchie as president. The new corporation has applied to the Board of Estimate for an exclusive franchise to operate 10 crosstown bus lines at 5-cent fare, and 3 longitudinal bus lines at a 10-cent fare, covering in all about 50 miles of routes with a universal transfer system.

There is to be a provision for recapture by the city at the end of 5 years for the purpose of municipal ownership and operation. If the franchise is granted, the corporation will eliminate 25 miles of street car tracks, formerly owned by the New York Railways Co., remove 200 trolley cars, and relinquish perpetual franchise held by the company.

The Board of Estimate is also considering franchise applications from the Service Bus Corp. to invest more than $6,000,000 and to operate 422 buses on 12 Manhattan routes on a 5-cent fare, and one from the Peoples Electric Bus Corp. for the operation of gas-electric buses on 12 routes on a 5 and 10-cent fare.

Knight Vice-President

CHICAGO, Mar. 1—Boyce W. Knight, who for the last five years has been associated with the Ensign Carburetor Co. as sales manager, has recently been elected vice-president in charge of sales.

Calendar of Coming Events

SHOWS

Feb. 15-Mar. 15—International Automobile Show, Copenhagen, Denmark.

Apr. 3-14 — International Motor Car Show, Frankfort-on-Main, Germany.

May—International Street and Highway Traffic Safety Exhibition, City Hall, Vienna, Austria.

CONVENTIONS

Mar. 23-25—National Conference on Street and Highway Safety, Washington.

Apr. 21-23—American Welding Society, Engineering Societies Bldg., New York City.

May 13-15—American Gear Manufacturers Association, Tenth Annual Convention, Book-Cadillac Hotel. Detroit.

June 8-10—Automobile Body Builders Association, Detroit, Hotel Statler.

June 14-19 — Automotive Equipment Association, Mount Royal Hotel, Montreal, Canada.

June 16-18—Thirteenth National Convention, Society of Industrial Engineers, Philadelphia, Bellevue-Stratford Hotel.

RACES

Mar. 21—Los Angeles, Cal.

Apr. 15—Fresno, Cal.

May 1 — Races at opening of new Speedway, Atlantic City.

May 10—Charlotte, N. C.

May 30-31 — 500-mile race, Indianapolis.

June 12-13 — Rudge-Whitworth 24-hour stock car race, Le Mans, France.

S. A. E. MEETINGS

National

Mar. 25-26—Annual tractor meeting, in cooperation with American Society of Agricultural Engineers, Chicago.

June 1-4—Semi-annual meeting, French Lick Springs, Ind.

Sectional

Mar. 9 — Philadelphia.
Mar. 10—Dayton, Ohio.
Mar. 11—Detroit.
Mar. 11—Indianapolis.
Mar. 12—Los Angeles.
Mar. 15—Cleveland.
Mar. 16—Buffalo, N. Y.
Mar. 25—Detroit.
Mar. 26—Chicago.
Apr. 7 — Milwaukee.
Apr. 8 — Detroit.
Apr. 8 — Indianapolis.
Apr. 19—Cleveland.
Apr. 22—Detroit.